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# USSR Report

SCIENCE AND TECHNOLOGY POLICY

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5 October 1984

## USSR REPORT

### SCIENCE AND TECHNOLOGY POLICY

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## ECONOMIC, ORGANIZATIONAL LEVERS IN 'SCIENCE, PRODUCTION' SYSTEM

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 5, May 84 pp 47-55

[Article by Chief of the Economic Planning Main Administration in the Ministry of the Electronics Industry and Doctor of Economic Sciences and Professor Petr Mikhaylovich Stukolov: "Economic and Organizational Levers in the 'Science and Production' System"]

[Text] Improvement of the forms and methods of planning, managing and incorporating cost accounting relationships in the "science and production" system on the basis of providing for the organizational unity of science, technology and production is of great importance under the conditions of accelerated development of scientific and technical progress. Solution of these problems on the level of a primary link is assuming particular urgency in the capacity of which production associations and scientific production associations are appearing, and where the economic preconditions are being created directly for accelerating scientific and technical progress and its achievements are being implemented.

Analysis of the work of associations indicates that concentration of scientific developments and production within their limits under the same administrative and technical management, efficient specialization of the services of science and production, and proper selection of the organizational and production structure and planning forms and methods that correspond to them make it possible to considerably reduce the time periods for developing and assimilating products for mass use, to raise their technical level, and to increase the percentage of renewing a products list (by virtue of longer-range products) and the relative share of the highest quality product in the over-all volume of output that is being produced.

However, until the present time, organizational and economic unity in the "science and production" system, which is one of the most important factors for accelerating scientific and technical progress, was not provided for in the primary link of production. In spite of the creation of scientific production associations, the scientific research institutes, design bureaus, enterprises and factories that form them are structurally isolated subunits [podrazdeleniye] with their own separate plans. The stages of scientific research operations and experimental design developments are concentrated in the NII [scientific research institute] and KB [design bureau] and the preparation of



production and series output of products are concentrated in enterprises. A rupture both according to time periods and other characteristics appears between the stages because of a number of economic and organizational reasons. Continuity of the cycle in the "science and production" system is disturbed as a result.

Within the limits of the NPO [scientific production association], the organizational unity of subunits encompasses primarily the solution of problems for centralizing management, establishing operational deadlines and priority, selecting and placing personnel and so forth. At the same time, scientific, planning and industrial subunits each has its own system of indicators and, as a rule, they do not form a single cost accounting complex with a single balance sheet and current account with general sources of financing. Accordingly, there are also differences in the planning, accounting and evaluating systems. Therefore NII and KB workers aren't always materially interested in improving the indicators of production subunits and associations as a whole. Differences in the approach to calculating operating costs and results of industrial enterprises, scientific research institutes and design bureaus hamper the effective and complete integration of all NPO subunits into a single cost accounting complex.

The solution of these problems requires further improvement of the entire system for managing (planning--including the incorporation of through-planning in the "science and production" system--and evaluating activities, cost accounting relationships, material and moral stimulation, and organizational structure) scientific production associations as a whole and the subunits that comprise them.

At the present time, 48 approved and accounting indicators, which characterize the operation of industrial enterprises and scientific research organizations (the same indicators are established for series and experimental plants as well), are being used in planning and evaluating NPO activities. This considerably reduces the effectiveness of scientific industrial associations as a progressive form for implementing the achievements of scientific and technical progress.

In our opinion, single planning indicators that do not characterize the separate aspects of their activities but the final work results must be established for scientific production associations. This will make it possible to combine the efforts of science and production workers and to provide for their equal responsibility for creating and incorporating new equipment, reducing the cost of it and improving quality. Thus, it is necessary to plan the following indicators according to a division of NPO production output and operations: tasks according to the production of new and the most important products in physical terms; tasks for transferring technical specifications and models of new equipment to production associations (enterprises) and for conducting installation assistance and start-up and adjustment operations; tasks of special-purpose comprehensive programs for the development of equipment and manufacturing methods and a plan of the most important NIOKR [scientific research and experimental design work]; volume of the product that is being sold with regard for fulfilling contractual obligations, including experimental

operations; and the relative share of output: the highest category of quality proceeding for export and in over-all volume new output being produced in an industry according to the direction assigned to the NPO.

It is advisable to establish three over-all indicators according to the "labor and social development" division: growth of labor productivity that is calculated according to combined output and operational volumes and personnel strength of NPO's; the general wage fund of NPO's, including that for scientific research; and funds for material incentive, sociocultural measures and residential housing construction that are being generated as a whole in accordance with NPO's. In accordance with finances, one must plan the savings of national labor (including cost savings in the production and consumption of a product) and planned savings in the estimated cost of NIOKR that are being performed for foreign organizations; the volume of outlays for scientific research, including that in accordance with financing sources; payments into the budget and allocations from the budget; and the production development fund that is generated in accordance with the relationship to all basic NPO funds.

Such indicators as the long-term subject plan for NIOKR, volumes of commodity (gross) and standardized net production, quotas for worker and employee strength, average wages for workers, marginal level of costs for 1 ruble of commodity production, profit and a number of others must become calculated ones for NPO's.

It is advisable to use such basic indicators as the volume of NIOKR, their obligatory products list, the scientific and technical level of developments, the incorporation of NIOKR at NPO enterprises and in industry, and the wage fund for planning the activities of NII's and KB's that form a part of scientific production associations. The indicator of the obligatory operational products list is the basis for composing the overall plan of NII's and KB's and the production plan of an experimental plant.

For an experimental plant it is necessary to plan the volume of experimental operations and the new product in physical terms, the volume of output being realized by virtue of these operations, the wage fund, the volume of centralized capital investments, the introduction of fixed capital by virtue of centralized investments, and payments into the budget and allocations from the budget.

Providing for cycle continuity in the "science and production" system requires the introduction of through-planning in the form of mutually coordinated plans: a long-term subject plan according to NIR [scientific research work] and OKR [experimental design work], the incorporation of developments into production (at an experimental plant or directly at a series production plant) and the transfer of products to series production enterprises that were assimilated earlier at an experimental plant, the preparation of production and the re-tooling of enterprises, and the production of new equipment.

A system of continuous planning for a three-year period is most acceptable so far as the duration of such comprehensive planning can't be restricted by the limits of one calendar year and the assimilation of new equipment in production

is connected, as a rule, with partial fixed capital replacement. In this case, the long-term subject plan for the first year must serve as the basis of the assimilation plan for the second year, which in turn determines the plan for preparing production and retooling an enterprise and the plan for producing new equipment for the third year. The tasks and indicators of the second and third year are subjected to refinement and correction in accordance with the results of developments, research and operations that are conducted according to the preparation of production, and the next year they will become the basis of the plan for the next year that is being planned.

The proper organization of cost accounting relationships is of great importance for improving the work of scientific production associations. It must orient NPO workers of the industry to the outstripping development rates of scientific research, to aim them towards searches for new areas in the consumption of new technology, and to reduce to a minimum the organizational separation between all stages of the cycle for creating a new product. The enumerated conditions are important factors for accelerating scientific and technical progress and are the basis for cost accounting in the "science and production" system.

The cost accounting criterion of efficiency of activities for each subunit that is included in a NPO must define the contribution of a given structural unit in achieving the development goals of associations as a whole and orient the collectives of scientific research, design, planning and design, and industrial organizations and experimental and series production plants towards the most rapid satisfaction of demands in the production of a prescribed products list and the high quality of products and efficient use of all available scientific and production resources. When the matter on cost accounting relationships is stated in a manner such as this, the efficiency of scientific production activities of NII and experimental plants is expressed not only in performing NIOKR at a high scientific and technical level, but also mainly in reducing the entire "research--development--assimilation in production" cycle and in expanding the scales for assimilation of the results of NIOKR in series production and by virtue of this obtaining a real economic effect.

In our opinion, it's impossible to speak about the incorporation of cost accounting if the final results of the use of NIR and OKR at series production plants of NPO's will not be taken into consideration when evaluating and materially stimulating the activities of NII and experimental plants. It is necessary to evaluate the work of these subunits only on the basis of calculating their actual contribution to the final results of an association's activities.

Improvement of cost accounting and material stimulation of NPO workers, and first and foremost of scientific subunits, can proceed along the following directions:

--deducting a fixed portion of profit from the output of a new product during the course of two to three years following its assimilation in industrial production for the payment of bonuses to workers who participated directly in developing and assimilating the new technology,



--changing the procedure for the payment of bonuses during which not more than 40 percent of the bonus rate is paid for the successful completion of NIR and OKR and not less than 60 percent of the bonus rate is paid during assimilation and transition to the next stage, and

--removing restrictions in accordance with the observance of mean diagram relationships and "forks" when establishing salaries for managerial engineering and technical personnel and employees, as well as for structural subunits.

The results of NIOKR exert an influence on the use of resources and objects of labor, industrial processes, forms and methods for organizing production, and the increase in the relative share of a product belonging to the highest category of quality, as well as on the reduction of the labor-intensiveness, materials-intensiveness, output-capital ratio and power consumption of a new manufacturing method and on the savings of living and material labor. While examining the effect of scientific and technical progress from these positions, one can speak about the fact that it is a source of additional resources and, consequently, a statement of the question is possible concerning reimbursement of those costs that are required for implementing it by virtue of them. This means that in the management system of NTP [industrial planning norms] one can and should intensify the influence of cost accounting principles both within the very realm of scientific and technical progress and in interrelationships of it with other economic processes.

In our opinion, a system of this kind can be built in the following manner: an association by virtue of creating reserve funds acquires scientific developments among NII's and KB's and transfers them for assimilation to series production plants which, while obtaining an appropriate economic effect, return resources that were advanced for science to the association. Similarly, it's possible to build relationships between the industry (in the person of central boards) and associations.

Financing scientific research of industrial designation must be done not from profit, but by virtue of the production cost of commodity production, since profit is not a stable indicator because of frequent price revisions in the industry. In a practical manner, this is possible to implement by means of establishing an acceptable standard of deductions to the development fund for scientific research as percentages of the production cost of output.

In many respects, the length of the "science and production" cycle and acceleration of the assimilation of new technology depend on the organizational and production structure of associations, which must possess a flexible reaction to changing technical and economic requirements for the product being produced. One of the ways for putting these requirements into effect is improving the organizational structure of associations on the basis of creating scientific production complexes (NPK), scientific technical departments (NTO) and scientific production sectors (NPS). Their organization is being implemented in accordance with the trends of technology and the entire complex of operations in the "research--development--production" cycle is being performed in them. As the experience of the electronics industry shows, forming structural units of this kind makes it possible to provide for closer contact of science with

production and it exerts a considerable influence on improving the operational efficiency of associations.

In accordance with their organizational structure NPK's, NPS's and NTO's differ considerably both from the structure of independent design bureaus and enterprises and from plants with OKB's [experimental design bureaus]. For example, subunits of design and industrial preparation and of experimental and series industrial production are consolidated in scientific production complexes. One or several topical departments and one or several shops of basic or ancillary production, which interact between themselves as the links of a single integrated system, can be part of a complex.

A principally new collective, in which science became a directly productive force and one which has organically joined with production, is being created in a practical manner in NPK's; scientists and designers are taking a most active part in resolving production tasks and production workers are participating in improving the quality of products and their technological properties. Scientific and design subunits in the structure of complexes are participating in the creation and assimilation of new technology in production, and they are responsible together with production subunits for the final result--production output with high technical and economic indicators. Thus, KB's of the complex are accomplishing the function of development, design and industrial preparation of production, and assimilation and operational management of new production output. Production workers jointly with development workers are improving the manufacturing method of production and they are participants in the "development and assimilation" cycle who enjoy equal rights and equal responsibilities.

The organization of work in the form of scientific production complexes makes it possible to considerably improve operational control and analysis of the industrial process, to create active feedback and to eliminate functional separation and disputed situations between development workers and production workers. As a rule, with the creation of a complex almost all new products are being assimilated already in the course of their development, and that provides for a considerable reduction in the average length of the "research--development--production" cycle.

Let's illustrate the efficiency of creating scientific production complexes in the work example of one of the associations. The association is executing a large products list of items that is being delivered in accordance with 12,000 contracts. Several plants and KB's form part of it. Improvement of the organizational structure of subunits and the system for management and material stimulation was made in it in accordance with a program approved by the ministry. Five NPK's in the association were organized in accordance with the trends of technology being produced. A single fund was created for the material incentive of workers in science and production that is distributed among the NPK's in a differentiated manner on the basis of stepping up planned tasks in accordance with basic indicators and is used by the management of complexes in accordance with the operating situation.

Fulfillment of the goals that were set before the association (to create instruments at a high scientific and technical level and to accelerate



considerably the "research and production" cycle) required the development of scientifically well-founded, comprehensively long range programs for technical (until the year 2000), economic and social (until 1990) development of the association.

The implementation of measures specified by these programs makes it possible to successfully resolve the tasks for acceleration of scientific and technical progress that confront collectives of the association's scientific production complexes. Beginning with the 10th Five-Year Plan, 50 percent of the created products are being assimilated in series production in accordance with an abbreviated cycle. For example, the average "research and production" cycle of microcircuits was reduced from 5 to 2.5 years. This provides an enormous economic effect among the equipment's development workers. Experience that was amassed by the complexes in conducting NIOKR in accordance with an accelerated cycle by means of combining separate stages and conducting operations simultaneously found reflection in the association's standard on "Procedure for Developing, Coordinating and Approving the Completion of (Through) Schedules in Developing and Assimilating the Production of New Products and Controlling Their Execution."

More than 50 percent of output that is subject to certification is being produced by the association with the emblem of quality. Out of 44 products (x-ray instruments) that were developed at the NPK during the 10th Five-Year Plan, 34 were accomplished at the level of and above world achievements and, in addition, 20 of them do not have foreign counterparts in view of the priority of design solutions. Production volume in the association is doubling with each five-year plan, labor productivity at the end of the 11th Five-Year Plan will be 10 times higher than during the 8th Five-Year Plan, but wages for this period will only double.

In contrast to NPK's, scientific production sectors are a combination of an institute's scientific subunits and a design bureau with separate shops or production sections. It is typical for NPS's that technical management of production in all links is accomplished by an institute's subunits, and the production sections (lines) of plants are the basis for creating instruments at all stages of OKR. A chief designer and his deputy, who are responsible for the manufacturing method of production, are designated during the development of an instrument. The institute's laboratories bear responsibility equally with the production subunits for the technical level of production and for industrial discipline.

The formation of scientific production sectors is conducive to a reduction in the number of specialists who participate in the "development and production" cycle. The manufacturing method is worked out to the maximum degree with this form of organizing production for a new product, and that creates conditions for an increase in the level of standardizing and unifying processes and products, an improvement in the quality of products and an increase in personnel skills.

The organizational structure of scientific production sectors is a centralized, linearly functional system with elements of a matrix structure. Forming them

in one of the industry's associations, incorporating programmed planning that encompasses the entire "research and production" cycle, as well as implementing a number of other measures (such as improving methods for network planning and the management of development workers, using progressive planning methods, and organizing the assimilation of products at a series production plant simultaneously with the completion of OKR) made it possible to reduce the "research--development--production" cycle by a factor of 1.5 to 2.

Scientific technical departments (NTO) were created in accordance with basic operational trends for the purpose of developing large comprehensive subjects in a number of associations. Their basic advantages are in a more profound specialization and concentration of the process for creating new products, an increase in the level of product standardization and range of application, the centralization and specialization of all kinds of ancillary servicing, and the concentration of technical support services by means of combining appropriate subunits into a single department.

As a rule, one or two scientific development subunits (departments of an institute) and one shop (factory) of an experimental plant form a part of scientific technical departments. Thanks to this the possibility was created for conducting comprehensive equipment development, including the concluding stage of the cycle--the manufacture of test models--which includes the over-all set-up, finishing, bench testing and assimilation of test models belonging to buyers.

There are sections for long-range developments, the basic task of which is the creation of a scientific and technical stockpile of semifinished products for developing new instruments or equipment, as part of the departments. These sections conduct underway scientific research studies for the analysis and selection of new ways of creating instruments, and they conduct applied scientific research studies for researching new kinds of equipment and industrial processes.

Thus, the organization of NPK's, NPS's and NTO's as structural subunits in scientific production associations provides the opportunity for rapid reorganization of production and the management system for the tasks of accelerating the introduction and assimilation of new technology and creating a single system of operational through-planning in accordance with NIOKR and assimilation of their results in production.

The work experience of industry shows as well that the most efficient structure of a "science and production" organizational system is when series production plants are part of NPO's along with NII's, KB's, experimental plants and factories. The necessity for including the latter in the NPO structure is determined first and foremost by the fact that the process of creating modern and particularly complex products does not end with the production stage of the first industrial series. On the contrary, under the conditions of high change rates of the products list of output (requirements) that are caused by scientific and technical progress, series production is that crucial stage during which direct contact is established between science and production, and considerable qualitative changes of the new products are provided both in accordance with consumer characteristics and particularly in accordance with economic

features (reduction of the level of costs, prices and so forth). In turn, achievement of the indicated characteristics will become possible if science is connected with implementing them. When including series production plants as part of NPO's, questions must be resolved on optimum specialization, efficient sizes and distribution of production units, close cooperation between them, and the organization of specialized procurement and ancillary factories.

The process of intensifying specialization under modern conditions cannot be reduced to producing homogeneous products or to constricting the list of products being produced. This contradicts tendencies for the development of scientific and technical progress. Therefore, at specific enterprises it's necessary to stipulate the kind of product assortment (at times heterogeneous) that provide for maximum use of equipment and material, labor and financial resources with a minimum of national economic costs and for the satisfaction of demand within concise time limits. In turn, the process of intensifying specialization requires constantly improving the production structure and establishing a mutual interrelationship of the separate elements that form a part of it and that are capable of providing for the production of high-grade and high technological quality products and the rapid reorganization of production when there is a transition in production from one kind of product to another.

Simultaneously with this it is important to establish proper relationships between scientific research, design, industrial, experimental and production subunits, and that will make it possible, depending on the specific conditions of activities and type of associations, to provide for conformity of the scientific and technical potential and capacities of experimental and production subunits. Achieving conformity of this kind is one of the most important conditions for increasing the work efficiency of associations as a whole, reducing the "science and production" cycle, improving the quality of products and increasing the technical and economic level of production.

In spite of definite successes in the area of improving the organizational forms of scientific and technical progress, in a number of instances a gap still exists between experimental and design development workers and the commencement of product assimilation. First of all, one can reduce it through the broad incorporation of combining the stages of experimental design developments and assimilation. As analysis shows, in this case the "development and assimilation" cycle is reduced by 3 to 9 months and total costs are decreased by 10 to 20 percent. At the same time, with current separate financing of OKR and assimilation and with the operating situations regarding the payment of bonuses, a cycle reduction of this kind also leads to a bonus decrease and that retards the incorporation of combining the design phase with the assimilation phase.

In the CPSU Central Committee and USSR Council of Ministers decree "Measures on Accelerating Scientific and Technical Progress in the National Economy", special attention was attached to matters for removing obsolete products from production. It was stated in it that a product, which is not certified in accordance with the highest and first categories of quality, i.e. obsolete, must be removed from production and the price for it reduced up to 30 percent.

In accordance with the current procedure an obsolete product according to a ministry's representation is determined by GOST, which can regard the product as obsolete, but it will be essential to a consumer. It is unprofitable for the enterprise to manufacture the product and by which the production priority is reduced. This leads to a cost increase and underloading of equipment. The very removal from production of a product of this kind can generate a scarcity of it. If a more ideal counterpart, even one having a lower price (that's rather seldom), causes considerable changes in the schematic solutions of an installation, equipment and production lines and, as a consequence, additional and highly substantial costs, then it (regarding the new technology) will hardly be profitable for the consumer. And this is unprofitable as well from the point of view of the national economy. As regards commodities for national consumption, the actual demand for it is the sole criterion that determines whether this product is obsolete or not, and in the final analysis it has an influence on price changes for commodities of this kind.

It seems more correct for obsolete products that have an industrial designation to reduce the price by 30 percent at the producer and to double it as a minimum for the consumer. It is for the manufacturer to establish a price that corresponds to his costs with regard for the accepted standard of profitability. The difference in the price must go into the budget income. In our opinion, it is necessary for enterprises that produce fully complete products to simplify the procedure for transferring obsolete products to the category of spare parts, and at the present time products of this kind that go entirely for operating needs belong to the latter. It would be advisable also to put products in this category that intended for the equipment supply system too, if the share of the product that is going to the supply system doesn't exceed 20 percent in its over-all volume.

Providing for the operational stability of associations and manufacturing enterprises is closely connected with increasing the responsibility of buyers for determining demand for the new technology (as a rule, they overstate it), and which appears as a main factor when justifying the necessity for development. However, in the latter now demand for the developed product often fluctuates sharply during the assimilation stage. Production costs are increased considerably in the event it is reduced and the time frames for recovering production costs are increased; when there is an increase, production proves to be unprepared for the sharp increase in producing the developed products, and that retards the process of satisfying demand and leads to the appearance of a so-called "scarcity."

This problem assumes particular acuteness in connection with commodities of a cultural and personal designation. At the same time, there is no clear-cut division of responsibility between head industrial ministries and the USSR Ministry of Trade on matters of estimating the demand for them. Basically, industrial ministries resolve this problem on a local basis without considering the interrelationship of them with other consumer goods, consumption trends of the family budget, and the dynamics of its change. On the other hand, the USSR Ministry of Trade at best reflects current demand with regard for the



remainders of commodities in warehouses. In this case, it bears no responsibility whatsoever for overstating the magnitude of demand (renunciation of the stated demand).

In our opinion, the leading coordinating role in this regard must belong to USSR Gosplan which must rely on the USSR Ministry of Trade's business condition services and on the head ministries. At the same time, it's necessary to limit the number of ministries that are producing the same kinds of commodities, and that certainly affects their quality, an increase in priority and the acceleration of assimilation. In a number of cases while exercising the right of the head one in accordance with diverse and at times formal reasons, some ministries are retarding the assimilation of a more improved product and are generating unhealthy business competition.

The improvement of management in the "science and production" system requires as well the solution of a number of organizational and systematic matters. First of all among them are the insufficient study of matters for accomplishing mutual calculations in an association between production units, the use of a price system with internal calculations, the opening of accounts, the organization of cost accounting (contractual) relationships both within an association and beyond its limits, and others. Creating a single system for financing the development of an association, introducing a more efficient wage system for the workers of science and production, and working out the legal aspects of planning scientific and production activities will promote a consolidation of cost accounting in associations.

The proposed systematic approaches to resolving tasks for management of the "science and production" system on the basis of an improvement in the organizational forms of scientific and technical progress and cost accounting in this system are directed at the most rapid assimilation of developments in production, an increase in the efficiency of science and production, and an improvement in the system for planning and economic stimulation.

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## ROLE OF SIBERIAN DEPARTMENT IN REGIONAL PRODUCTIVE FORCES

Moscow POLITICHESKOYE SAMOOBRAZOVANIYE in Russian No 5, May 84 pp 31-39

[Article by Vice President of the USSR Academy of Sciences and Chairman of the Siberian Department of the USSR Academy of Sciences V. Koptug: "The Science and Productive Forces of the Region"]

[Text] Following the victory of October science became in our country one of the fundamental factors of the building of a new society. Scientific research is having a more and more effective influence on the development of productive forces. "Intensification, the rapid introduction in production of the achievements of science and technology, the implementation of major comprehensive programs," Comrade K. U. Chernenko noted at the February (1984) CPSU Central Committee Plenum, "all this in the end should raise the productive forces of our society to a qualitatively new level." It is natural that under these conditions scientific collectives are called upon to steadily increase the efforts, which are aimed at the increase of the effectiveness of research work, and to promote more actively the large-scale introduction of the achievements of science in production.

In this article it will be a question mainly of the socioeconomic importance of science for the development of Siberia. But first I would like to note the scale and rate of its present economic development. Whereas in one of the leading petroleum-producing provinces of the country in the past 100 years were needed in order to produce 1 billion tons of petroleum, in Tyumen Oblast the first billion were produced in 14 years and the second billion in 3 years. This is also what is figuratively called today "Siberian acceleration."

Immense construction projects--the Baykal-Amur Railway Line, new hydroelectric power stations, coal strip mines, giants of the petrochemical, pulp and paper, aluminum and other sectors of industry--have been launched on the entire territory of Siberia. Thousands of kilometers of main oil and gas pipelines have been put into operation. In recent decades Siberia has turned into one of the most important economically developed regions of the USSR. The rate of its development steadily exceeds the average rate for the union, while its share in the economic potential of the country is steadily increasing.

Along with the large-scale development of natural resources important results have been achieved in the increase of the standard of living of the

population, the working and living conditions of the people have improved noticeably. Behind all this is a policy, which is well thought-out and is being consistently pursued by the party, which since the first years of Soviet power has attached great importance to the development of the national resources of this region.

#### The Formation of the Siberian Department

When the 20th party congress adopted the decision on the acceleration of the development of the natural resources of Siberia and the Far East, the planned development of the eastern regions required the drastic increase of their scientific, technical and personnel potential and the development of their own advanced comprehensive scientific base. Although by that time four affiliates of the USSR Academy of Sciences--the West Siberian, East Siberian, Yakutsk and Far Eastern affiliates--were already operating here, their possibilities were obviously inadequate for the accomplishment of the tasks which arose in the 1950's in connection with the intensive development of natural resources and the development of productive forces in the eastern part of the country.

I will recall that in 1957, on the eve of the establishment of the Siberian Department of the USSR Academy of Sciences, 1 corresponding member of the USSR Academy of Sciences and 35 doctors of sciences worked at all the academic subdivisions beyond the Urals. Under these conditions the problem of the creation here of a powerful scientific base, and in the shortest possible time, could not be solved by the evolutionary development of the the subdivisions which existed. Cardinal steps were needed. A group of prominent scientists with world names--Mikhail Alekseyevich Lavrent'yev, Sergey L'vovich Sobolev and Sergey Alekseyevich Khristianovich--came forth with the initiative to establish a new department of the USSR Academy of Sciences, which was organized according to the territorial principle--the Siberian Department of the USSR Academy of Sciences. This initiative was supported by the CPSU Central Committee, the government and the USSR Academy of Sciences and began to be implemented after the adoption of the corresponding decree by the USSR Council of Ministers in 1957.

The rate of the formation and development of the Siberian Department in past years has not been as impressive as the scale of the transformation of Siberia itself. The strategy of the development of the department was based on the idea of the gradual setting up of large integrated scientific research centers at various points of the region. The Novosibirsk Center was the first such center. As a result of the dedicated labor of the construction workers and the constant attention of the Novosibirsk Oblast Party Committee the Novosibirsk academic city grew and owing to its scientific achievements acquired fame throughout the world.

Having laid a firm scientific base under Novosibirsk, the department subsequently concentrated its forces on the development and strengthening of the scientific centers located in Irkutsk, Krasnoyarsk, Tomsk, Ulan-Ude and Yakutsk. Affiliates of the Siberian Department of the USSR Academy of Sciences are operating efficiently here. The Institute of Natural Resources in Chita, the Institute of Coal in Kemerovo and the departments and laboratories in Barnaul, Kyzyl, Omsk and Tyumen are gaining strength.

Today 60 scientific research institutes and experimental design institutions, which encompass the most important directions of the natural, technical and social sciences, as well as about 70 magnetospheric, seismic, permafrost, biological and other stations are operating within the academic institutions of Siberia. The personnel potential has increased immeasurably: 77 academicians and corresponding members of the USSR Academy of Sciences, more than 450 doctors and 4,000 candidates of sciences and a large army of highly skilled engineering and technical personnel work in the department.

"The Siberian Department of the USSR Academy of Sciences with its institutes, affiliates and pilot production subdivisions," it was noted in the decree of the CPSU Central Committee (1977) on the activity of our department, "has become an important scientific center. Important basic and applied research, which is contributing to the increase of the scientific and technical potential of the country and the increase of the prestige of Soviet science, is being conducted here.

"The establishment of the Siberian Department of the USSR Academy of Sciences had and is having a direct influence on the development of the productive forces, education and culture of the eastern regions of the country and was responsible for the emergence of the Far Eastern and Ural scientific centers of the Academy of Sciences, the Siberian departments of the All-Union Academy of Agricultural Sciences imeni V. I. Lenin and the USSR Academy of Medical Sciences, as well as the enlargement of the network of higher educational institutions."

The task of the advancement of large-scale science to the east was posed by life itself and by the needs of the economic and social development of our society, and therefore its accomplishment became the affair of the entire country. The government agreed during those years to the allocation of very significant capital investments for the creation of the material base of science and the social infrastructure.

Favorable conditions were created for the formation of the scientific research potential and the system of training of personnel. Constant attention is being devoted to the department, daily assistance is being given on the part of the CPSU Central Committee, the USSR and RSFSR Councils of Ministers, the USSR Academy of Sciences and its specialized departments, the State Committee for Science and Technology and party and soviet organs locally. All this ensured the rapid achievement of the "critical mass," in case of which a chain reaction of the development of science and its applications begins.

#### Basic and Applied Research

In the fruitful development of the Siberian Department of the USSR Academy of Sciences the active participation in its establishment of prominent scientists and the founders of important scientific schools played a conspicuous role. The basic principles of the work of the department--the leading development of research on the fundamental problems of science, the closest contact with the national economy, the training of personnel for the meeting of the needs of

growing academic science, higher educational institutions and new fields of technology--were established by them.

Why when organizing the Siberian Department, which is called upon to actively participate in the solution of the national economic problems of the region, was basic research regarded as of paramount importance? First of all because its leading development in the area of the natural and social sciences affords fundamentally new means of accomplishing the tasks of practice. As experience attests, it is rarely possible to identify such means within narrowly oriented applied research.

I will cite the following example. The problem of removing sulfur dioxide from the waste gases of industrial works is quite well known. The need to solve this problem is dictated by two circumstances: on the one hand, the sulfur dioxide, which is being discharged into the atmosphere, is doing very serious harm to the environment and, on the other, its recovery would make it possible to give up entirely the importing of sulfur for the production of sulfuric acid. Many studies, which are oriented toward the solution of this important problem, have been conducted. However, with reference to the most prevalent case, when the content of sulfur dioxide in the waste gases is small and, moreover, changes in time, for a number of reasons they all came to a dead end. The studies of the peculiarities of catalytic processes under so-called nonstationary conditions, which were conducted at the Institute of Catalysis of the Siberian Department of the USSR Academy of Sciences, provided a solution of the problem.

As a result in 1982 at the Krasnouralsk Copper Smelting Combine owing to the intensive work of scientists of the institute and plant workers a facility of a new type was started up and it is operating efficiently. The processing of the exhaust gases of nonferrous metallurgy by this method not only will solve the ecological problem, but will also provide the country with several additional millions of tons of sulfuric acid a year and, consequently, millions of tons of fertilizers for agriculture.

Each of such appearances of science in practice causes not simply the improvement, but the cardinal change of technology, without which, as a rule, the sharp increase of product quality and the decrease of the materials- and power-output ratio of production, as well as labor expenditures are impossible.

On the basis of the mentioned example it is possible to illustrate another peculiarity of the results of basic research--the multiplicity, a kind of "fan-like nature" of their appearance in practice. Thus, the implementation of the nonstationary mode of catalytic processes is exceptionally promising for the large-tonnage production of sulfuric acid. Calculations show that here the consumption of metal on contact units is reduced and the capital expenditures as a whole decrease, and by several fold. This method also affords the possibility of the utilization in the interests of heat and power engineering of low calorie gas mixtures, including industrial waste gases, which contain small quantities of incompletely oxidized carbon-containing components, and even mine gas, which contains a certain amount of methane.



What has been said illustrates the great productivity and value of thorough basic research. Precisely for this reason the maintenance at the highest level of the scientific potential of the country, to which we can turn as a bank of diverse knowledge of the broadest purpose for the solution of some specific problems or others, is extremely important. The economy and advantage from the use of fundamental results also consist in this.

The development of science to a considerable degree depends on the elaboration of its methodological problems. The joint scientific councils of the department for the sciences are playing an important role in the determination of the promising directions of science and the identification of new trends of practice. I would also like to speak about the system of philosophical (methodological) seminars, which is providing invaluable assistance in this matter. After all, for the finding of the simplest and most effective means of settling arising questions it is very important to break away from narrow, special problems and routine means of their solution and to rise above them, so that it would be possible to take a fresh look at related fields, and at times also fields which are far from each other, from a broad general scientific and general social standpoint. Executives and students of the seminars of the scientific institutions of the Siberian departments of the USSR Academy of Sciences, the Academy of Medical Sciences, the All-Union Academy of Agricultural Sciences imeni V. I. Lenin, sectorial scientific research institutes and higher educational institutions of various cities of Siberia are taking part in the methodological conferences which are held annually. Such conferences and seminars are becoming one of the means of the unification of the intellectual potential of the Siberian region and, consequently, the intensification of scientific activity.

The work of the philosophical (methodological) seminars of the Novosibirsk Scientific Center received endorsement at the 26th party congress. In the future we have to develop the gained experience more actively and to extend it more extensively to other scientific centers.

#### Science and Production

In the decree of the CPSU Central Committee and the USSR Council of Ministers "On Measures on the Acceleration of Scientific and Technical Progress in the National Economy" a program of actions is specified, which is called upon to implement a uniform policy in this area, to increase the rate and scale of the development of new equipment, new materials and technologies and to use more thoroughly the developments of academic and sectorial institutes, as well as educational institutions. This confirms the correctness of the policy, which was adopted by the department starting with the first days of its existence and is aimed at the active search for practical applications of the results of scientific research, the development and improvement of the forms of interaction with the national economy and the acceleration of the introduction of scientific developments in practice.

It is difficult today to name sectors of the national economy, in which developments, which are based on the results of the scientific research of the departments, are not used. During the 10th Five-Year Plan alone about 1,500



scientific developments were turned over to the ministries and departments of the country.

In recent years at the department under the supervision first of Academician M. A. Lavrent'yev, and then Academician G. I. Marchuk a multilevel system of the interaction of academic science with various spheres of the national economy was formed by the efforts of all the scientific institutions, as well as design and production collectives and with the support of party and soviet organs.

One of the important units of this system is the direct ties of the institutes of the department with the industrial and agricultural enterprises of Siberia. The councils for the promotion of scientific and technical progress, which have been set up under auspices of a number of Siberian oblast and kray party committees, are giving us much assistance in this matter. The work of the Novosibirsk Oblast Party Committee on the strengthening of the ties of science with production, in particular, was commended at the 26th CPSU Congress. ASU's (automated control systems) and ASUTP's (automated control systems of technological processes), explosion welding and explosive forming, the production of complicated special-shape items from sheet metal by extrusion under the conditions of creep, the hardening of thin-section items made from aluminum alloys, the development of vibration-proof tools and machines and much more can serve as examples. The department is striving to broaden and strengthen the ties with industry at all our scientific centers.

The interaction of the Siberian Department with large plants and sectorial scientific research institutes and design bureaus serves as the basis for the establishment of extensive creative ties with the sectors of the national economy. At present the Siberian Department has bilateral long-term agreements with 22 union and republic ministries and departments. The basic goal of such cooperation is the joint solution of urgent scientific and technical problems and the acceleration of the use of the results of research for the increase of the quality of the output being produced by means of new technologies, instruments and materials. The collectives of the institutes and enterprises, which have been united by goal programs, have learned to work together, and this interrelationship ensures the practicability of the adopted programs and their attachment to the national economic plan.

Not only today's needs of the sectors, but also research work, which is aimed at the future, find reflection in the programs of cooperation. At the same time the directions of science and technology, which the Siberian Department should intensify in order to ensure scientific and technical progress, are clarified. These are, in particular, the mechanics of new materials, the automation of designing, the mining and chemical processing of coal and so forth.

The "zone of introduction" of the Novosibirsk Scientific Center of the Siberian Department of the USSR Academy of Sciences--the system of sectorial scientific research institutes and design bureaus--is one of the effective forms of cooperation with ministries. The enlistment by ministries of highly skilled specialists and the use of the scientific developments of the institutes of the department are helping to assimilate technical and

technological innovations in the shortest possible time and to perform work at the highest contemporary level.

At the same time within the programs of cooperation with ministries and the development of ties with sectorial design bureaus and enterprises it is possible for the present to solve successfully the problems which interest only a given specific sector. At the same time the introduction of operations of an intersectorial nature, the proportion and significance of which are steadily increasing, is encountering great difficulties, since frequently not one sectorial organization takes them upon itself. The academic institutes' and scientific centers' own pilot production base is especially important for the solution of such problems. Therefore, following the instructions of the 26th CPSU Congress on the need for the development of the pilot production base of science, the department is devoting the most serious attention to this question.

The search for new forms is also continuing. Thus, the Intersectorial Design Department with the participation of the Institute of Automation and Electrometry of the Siberian Department of the USSR Academy of Sciences contributed to the rapid assimilation of complex laser units at the Instrument Making Plant imeni V. I. Lenin. A decision on the organization on the basis of the Novosibirsk Sibelektrorum and Elektroagregat enterprises and the pilot works of the Institute of Nuclear Physics of the Siberian Department of the USSR Academy of Sciences of the industrial production of accelerators for many advanced radiation technologies is being prepared. The creation of such associations of industry and science is regarded in the decree of the CPSU Central Committee and the USSR Council of Ministers "On Measures on the Acceleration of Scientific and Technical Progress in the National Economy" as one of the important means of bringing industry of our country to the most advanced levels.

The goal program approach, which is oriented toward the management of all the units of scientific and technical progress, starting with the stage of scientific development and ending with series production, is one of the important directions of the increase of the efficiency of science at the present stage. The State Committee for Science and Technology and the USSR State Planning Committee regard comprehensive goal programs as one of the most important levers of influence on the science-production system.

The institutes of the Siberian Department are participating in the work on 24 comprehensive goal programs and 47 programs, which are aimed at the solution of the most important scientific and technical problems in the area of power engineering, the prospecting, production and processing of petroleum, gas, coal and other minerals, chemistry and powder metallurgy, automation and computer technology, construction and agriculture, health care and environmental protection.

New interesting forms of the connection of academic science and industry are now being effectively developed in other cities of Siberia, where scientific centers of the department are located.

Thus, a special-purpose association, to which scientific research and planning institutes, higher educational institutions and enterprises of the chemical, petrochemical and pulp and paper industries belong, was set up on the initiative of the Irkutsk Institute of Organic Chemistry with the support of the Irkutsk Oblast Committee of the CPSU. It is oriented toward the acceleration of the development and implementation in industry of important directions, which are connected with the development and production of organosilicon compounds, polymers and catalysts of petrochemical and coal-chemistry synthesis and coal gasification, as well as with the complete processing of wood.

The creation of original centers of the promotion and turning over of scientific and technical achievements of an intersectorial nature to the national economy merits serious attention. The work launched in Tomsk and Tomsk Oblast on the reconditioning and the lengthening of the service life of parts of machines and devices by the methods of powder metallurgy serves as an example of this.

#### The Socioeconomic Role of Science

Today, when in conformity with the instructions of the 26th CPSU Congress truly imposing tasks on the assimilation of the natural resources and the development of the productive forces of the eastern regions of the country are being accomplished, the far-sightedness of the party and government, which showed concern in good time for the formation of the scientific base of Siberia, is especially obvious. Thus, all the conditions were created so that the elaboration of the prospects of the development of this region would be based on the scientific potential, which has been accumulated and is being constantly reinforced--the potential of knowledge, material and technical means and skilled personnel.

The use of the results of scientific research in the forecasting, long-range planning and formulation of programs of the development of the productive forces and the assimilation of the natural resources of the Siberian regions is one of the exceptionally important means of the more and more extensive appearance of the Siberian Department of the USSR Academy of Sciences in the national economy. The participation of the department in preplanning studies, in the evaluation of the means of scientific and technical progress and the elaboration of recommendations on the development of the national economy of the RSFSR and especially its eastern regions is acquiring a greater and greater scope.

The materials, which were prepared by the Siberian Department of the USSR Academy of Sciences jointly with various ministries and departments, as well as local soviet and party organs, were generalized in the major work "Ekonomicheskkiye i sotsial'nyye problemy razvitiya proizvoditel'nykh sil Sibiri na period do 1990 goda" [The Economic and Social Problems of the Development of the Productive Forces of Siberia for the Period to 1990], which was used by planning organs when formulating the five-year plan. Many ideas and proposals of Siberian scientists, which received endorsement at the All-Union Conference on the Development of the Productive Forces of Siberia, which



was held in Novosibirsk in 1980, found reflection in the documents of the 26th party congress.

The now widely known large-scale long-term scientific program "The Comprehensive Assimilation of the Natural Resources and the Development of the Productive Forces of Siberia" (in short, the Sibir' Program) became an important means of the concentration of attention and forces on the tasks of the national economic development of the region and the formation of a unified research complex. The set of scientific studies of the diverse problems of the social and cultural development of the peoples, who inhabit Siberia, and the efficient, balanced development of this enormous region also found its place in this program.

This program is a set of 40 scientific goal programs, which are devoted to the study and solution of a number of problems. Among them the use of fuel and energy, mineral raw material and biological resources, environmental protection, the introduction of new equipment and technology, the development of power engineering and agriculture of Siberia, as well as the problems of the Western Siberian Petroleum and Gas Complex, the Kuznetsk and Kansk-Achinsk coal basins, nonferrous metallurgy of Krasnoyarsk Krai and the economic development of the zone of the Baykal-Amur Railway Line are the most important.

A very significant feature of the Sibir' Program consists in the fact that it unites the efforts of several hundred organizations of various departments, of which only one-eighth belong to the Siberian Department proper.

In the decree of the CPSU Central Committee "On the Work of the Ural Scientific Center of the USSR Academy of Sciences" the task of the more complete utilization of the scientific potential--an urgent task for all the regions of the country, including ours--is squarely posed. Undoubtedly, we have to exert considerable efforts in order to carry out more effectively the coordination and cooperation of the activity of the scientific institutions of the region regardless of their departmental affiliation.

It is also extremely important that the program, as we believe, helps to avoid the miscalculations which frequently come to light in the national economic complexes of krais and oblasts only with time. A comprehensive scientific analysis and a thorough study of all the aspects of the proposed actions in their interconnection are especially necessary when making long-range decisions. On the scale of Siberian transformations even small disturbances of the balance turn into very appreciable losses. For example, when many years ago the production of Siberian petroleum and gas was begun, the rapid development in these regions at the same time as the extraction of petroleum of the production of motor fuel, for example, from gas condensate was not envisaged in the plans. This, undoubtedly, was a miscalculation which has come to light today: an enormous amount of motor fuel, which could be obtained locally without particular difficulties, is being imported to hard to reach northern regions. The Sibir' Program is called upon not to allow such miscalculations in the future.

Recently the Sibir' Program was examined and approved in the collegium of the USSR State Committee for Science and Technology with the participation of representatives of the USSR State Planning Committee, the USSR Academy of Sciences and interested ministries and departments, as well as at the meeting of the Presidium of the RSFSR Council of Ministers. The inclusion of a number of scientific and technical programs, which follow from it, in the five-year plan of USSR economic and social development for the 12th Five-Year Plan is envisaged.

Today participation in the compilation of the Comprehensive Program of Scientific and Technical Progress of the USSR to 2005 is a responsible job of the scientists of the department. The supervision of the drafting of the section of the program on the Western Siberian and Eastern Siberian economic regions has been assigned to our department. Academician A. A. Trofimuk is in charge of this work.

The summary document "The Comprehensive Program of the Scientific and Technical Progress of the Western Siberian and Eastern Siberian Economic Regions of the RSFSR to 2005," which consists of three sections: "Natural Resources," "Economic and Social Problems of the Development of Siberia" and "Scientific and Technical Progress and the Development of Science," has been submitted to the RSFSR State Planning Committee. The critical analysis of the concepts of the development of the Siberian regions, its scientific potential and the directions of scientific and technical progress is a long-term task of our academic institutions, which, on the one hand, is the basis of preplanning study and, on the other, makes it possible to see the place and role of each study from the point of view of the future.

Under present conditions, as was noted at the June (1983) CPSU Central Committee Plenum, the responsibility of social science scholars for the formulation of reliable forecasts and scientific recommendations on the problems of socioeconomic development and ideological work is increasing. The scientific institutions of the Siberian Department have conducted in recent years a number of important comprehensive studies in this direction.

Economists have obtained important results with respect to the problems of socialist expanded reproduction under the conditions of current scientific and technical progress; with respect to the methodology of the use of mathematical economic methods and models in planning; in the area of the study of the social processes which are connected with manpower resources and the standard of living of the population; the elaboration of several aspects of the improvement of the management of industrial production. On this basis work is being performed on the scientifically sound forecasting of the development of the economy of Siberia, the RSFSR and the country as a whole for the long-range future, proposals on the comprehensive development of the economy of the oblasts, krays and autonomous republics of Siberia are being developed. The Institute of Economics and the Organization of Industrial Production of the Siberian Department of the USSR Academy of Sciences is playing an important role in the formulation and specification of the key economic conception of the Sibir' Comprehensive Program.



The Institute of History, Philology and Philosophy in conclusion of large cycles of research published such multivolume works as "Istoriya Sibiri" [The History of Siberia], "Istoriya rabochego klassa Sibiri" [The History of the Working Class of Siberia], "Istoriya krest'yanstva Sibiri" [The History of the Peasantry of Siberia] and "Ocherki russkoy literatury Sibiri" [Essays on the Russian Literature of Siberia].

The Siberian school of archaeologists, which has made a significant contribution to the analysis of the historical role of the numerous peoples of Siberia and their place in the development of world culture, is being successfully developed. A wide range of studies on the problems of the development of the indigenous peoples of Siberia under the conditions of the intensive economic development of the region has been launched. Scientists of the Buryat Institute of Social Sciences and the Yakutsk Institute of Language, Literature and History have made a substantial contribution to the study of national relations in Siberia, to the study of the history, language and literature of the peoples of the region, as well as to the development of the culture and education of the autonomous republics.

Taking into account the tasks, which were posed for the social sciences by the June (1983) CPSU Central Committee Plenum, the Presidium of the Siberian Department of the USSR Academy of Sciences has taken steps, which are aimed at the further stepping up of the work of social scientists on the key practical directions. These problems have become especially urgent for economists in light of the decree of the CPSU Central Committee "On Increasing the Role of the Institute of Economics of the USSR Academy of Sciences in the Elaboration of the Key Questions of the Economic Theory of Mature Socialism." The party is making the appeal to ensure a new, considerably higher level of theoretical ideological work in the area of economic science and to make a decisive turn in the direction of the real practical problems which life is posing for our society. In particular, economists have to increase the attention to the studies of the economic and social questions of the intensification of the national economy, the management of scientific and technical progress, in the area of the methodology of the evaluation of the efficiency of new equipment and technology, the theory and methods of the improvement of the economic mechanism.

Historians, philologists, philosophers and sociologists have to launch comprehensive research on the generalization of the historical experience of the settlement and development of Siberia and on the study of the interaction of scientific and technical progress and social progress.

The scientific institutions of the department are influencing the development of the productive forces and culture of Siberia also through the system of education at the school, the higher educational institution and after the higher educational institution. One of the main forms of work at the level of school education is participation in the holding of the all-Siberian olympiads of school children, the winners of which are admitted to the specialized physics and mathematics boarding school attached to Novosibirsk State University. Similar forms of work with school children are being developed in Irkutsk, Tomsk, Ulan-Ude and Yakutsk. Scientists of the department are also participating in the development of new textbooks and the further training of

secondary school instructors. In connection with the reform of school education the attention of scientists to these problems will be increased substantially.

An important contribution has been made by the department to the improvement of the system of higher education of Siberia. The principle of the integration of science and education has undergone development at Novosibirsk State University. The experience of the cooperation of Novosibirsk State University with academic institutes is being used and developed not only in Novosibirsk, but also in other cities of the region. The scientific subdivisions are successfully cooperating with Krasnoyarsk, Tomsk and Omsk universities. Educational scientific complexes have been set up in Irkutsk on the basis of the university, the Polytechnical Institute and the institutes of the East Siberian Affiliate and in Yakutsk on the basis of the university and the Yakutsk Affiliate of the department.

The work with scientific youth holds an important place in the system of the training of personnel. In particular, a set of measures on the creation of favorable conditions for the scientific growth and the increase of the public activeness of young people is being implemented. Here much attention is being devoted to the activity of the councils of scientific youth and the holding of competitions of the works of young scientists.

Work on the increase of the skills and the further training of instructors of higher educational institutions and specialists of the national economy is being performed jointly with the RSFSR Ministry of Higher and Secondary Specialized Education. A special faculty for the increase of the skills of managerial personnel of the ministries and departments of the RSFSR and the planning organs of krays, oblasts and autonomous republics is operating on the basis of Novosibirsk State University and the Institute of Economics and the Organization of Industrial Production of the Siberian Department of the USSR Academy of Sciences.

A large detachment of highly skilled scientists, candidates and doctors of sciences has grown up at the institutes of the department. In recent years the role of graduate studies of the Siberian Department of the USSR Academy of Sciences in the training of personnel for sectorial science, higher educational institutions and enterprises of Siberia has increased noticeably. Moreover, a certain portion of the specialists, including candidates and doctors of sciences, transfer from the subdivisions of the Siberian Department to a job in other departments. Thus, today the Siberian Department not only is meeting its own needs for personnel of the highest skill, but is also having a substantial influence on the formation of the personnel potential of higher educational institutions and sectorial research and production organizations.

The Siberian Department of the USSR Academy of Sciences is operating in the 1980's as a mature research collective, which has a large scientific and personnel potential and experience in cooperating with the national economy. In the year of its 25th anniversary for the successes in the development of science, the implementation of its achievements in practice and the training of personnel it was awarded the Order of Lenin. This encouraging evaluation

by the party and government of the activity of the department is augmenting our forces and is increasing the responsibility of academic science for the implementation of the plans of the transformation of the eastern regions of the country.

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## SCIENTIFIC-TECHNICAL INFORMATION IN CENTRAL STATISTICAL ADMINISTRATION

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[Article by G. Simakov, M. Markovich, and S. Tiokhin: "Organization of the Service of Scientific-Technical Information in the System of the TsSU (Central Statistical Administration) of the USSR"]

[Text] The 26th CPSU Congress emphasized the need to improve the system of scientific-technical information and the patenting-licencing service in the USSR. In Conjunction with this the USSR Academy of Sciences in cooperation with the GKNT (State Committee for Science and Technology) worked out certain recommendations which will increase the efficiency of the organizations of scientific-technical information. These recommendations indicated that scientific-technical information plays a decisive role in accelerating scientific-technical progress. The establishment of an effective system of scientific-technical information will stimulate the growth of people's demand for information and will assist in developing a habit of using information.

It was projected to expand and to lower the cost of the means of processing information in the future. The most part of scientific-technical information will be stored on micro-fiche, magnetic tapes and other kinds of data-storage medium. One of the first tasks is to provide organizations of control with the information about scientific-technical progress, including achievements in major sciences. Currently the USSR is implementing a scientific-technical program for developing the State Automated System of Scientific-Technical Information (GASNTI) which will include all-union, central-branch, republican, inter-branch and other organs of information.

At the same time neither the USSR, nor foreign countries have depositories of scientific-technical information in the field of theory and practice of statistics. Scattered materials on statistics published in various information publications need additional selection, grouping, and analysis.

The Central Branch Organization of Scientific-Technical Information (TsOONTI) was organized in the NII TsSU SSSR (Scientific-Research Institute of the USSR Central Statistical Administration) to solve this problem. This organization will conduct necessary methodological and analytical work, and will coordinate activities with the central organizations of scientific-technical information; it will select and create depositories of information on the theory and practice of statistics. The activity of the TsOONTI will help to increase the efficiency of providing government statistical organizations with information as well as to improve the branch system of scientific-technical information as apart of the government information system.



The central branch information depository of scientific-technical information on statistics was established in the TsSU system to solve the aforementioned problems. Soviet and foreign literature and documents including deposited manuscripts, scientific research reports, specified-technical documentation, handbooks, catalogs, and proceedings of conference, consultations and seminars will be inputted into the depository on a regular basis.

It was decided to establish a Branch Automated System of Scientific-Technical Information (ASNTI 'Statistika') in order to provide government statistical organizations with updated scientific-technical information on aspects of the theory and practice of statistics, application of economic-mathematical methods, and modern computers. The Scientific Research Institute of the USSR Central Statistical Administration (NII TsSU SSSR) had already worked out major directions for the establishment of the system. A technique to employ the unified computer system (ES EVM) to process scientific-technical information in the area of the theory and practice of statistics and to use computers and mathematical methods in economics is being developed. The accumulation of information and the establishment of a data base have begun. The major scientific-methodological materials which will regulate the activity of the ASNTI 'Statistika' are being worked out.

The ASNTI 'Statistika' will coordinate the decentralized accumulation and processing of branch information with the completion of centralized depositories. It will also provide one-time processing of reuseable scientific-technical information. The method of preparing documents presumes 'thematic cooperation' of information services, divisions, and organizations of the USSR Central Statistical Administration. This means that each member of the cooperation will process its own initial documents while having access to any material in the central depository. This system will help to increase the efficiency and quality of information services, realization of multiple retrieval of documents under the mode of selective distribution of information, and retrospective retrieval. It will also increase the quality and efficiency of publications through the usage of modern printing techniques.

The ASNTI 'Statistika' will be included in the GASNTI and in the future will cooperate in every way with the International System of Scientific-Technical Information of the CEMA countries.

The ASNTI 'Statistika' will provide subscribers with a specialized complex information service. At the same time, this system will use data bases of other ASNTI's on the basis of information exchange through the computer medium and communication channels.

The TsOONTI faces great tasks of preparing and publishing (including computer readable publications) information of different kinds - bibliographic and abstracted materials, surveys, express-information, and etc.

Normative and methodological material- which regulate information activity in the system of the Central Statistical Administration of the USSR will be worked out on a new quality level. The activity itself will be coordinated with the Central Statistical administration of the USSR as well as with other organizations of scientific-technical information.

The major functions of the ASNTI 'Statistika' will include: gathering and preparing of information on the theory and practice of statistics on the basis of the Central Statistical Administration of the USSR publications and documents as well as accumulation of information about publications on the aforementioned topics in the USSR and abroad; input of information into the system and its storage; establishment and input of information collections; information service of the subscribers of the system in the form of selective distribution of information, retrospective retrieval, and T.V. availability. The functions of the ASNTI 'Statistika' will also include: distributing information collections recorded on computer readable media, and publication and preparation of copies of original documents per special order.

The selective distribution of information makes it possible effectively and systematically to provide information to divisions and organizations of the USSR Central Statistical Administration regarding information newly acquired by the ASNTI 'Statistika' according to their main subject inquiry. Retrospective retrieval will provide users with single-inquiry information output.

The ASNTI 'Statistiki' will consist of a supplying part and a complex of mutually connected functional and other subsystems, distinguished by the organization-functional and technological characteristics.

The development of this systems presumes the establishment of a unified terminological service, implementation and observance of the GASNTI headings and the requirements of government communication standards, as well as mastery and usage of standard planning decisions and packets of applied programs and other organizational means. The efficiency of the automated system will be evaluated by a number of criteria. In our opinion these criteria should include: the volume of collected scientific-technical information used in processing, storage, and retrieval, the schedule and volume of information publications, the number of subscribers to permanent and single inquiries for various kinds of services of the given system, dates of preparation and publication of information.

Considerable improvement of the quality of information service is planned to be achieved through the wide use of perspective forms and methods, in particular through purposeful and selective information of the workers of government statistics about all new arrivals on their subjects; through the establishment and constant updating of specialized subcollections on the most urgent problems of government statistics with a possibility of efficient retrieval of exhaustive multiaspect references on the basis of these subcollections; through establishment of an integrated data bank of the ASNTI 'Statistika' which would include retrospective depositories of annotated bibliographic descriptions and abstracts of the most interesting papers in the field of the theory and practice of statistics published in the USSR and abroad.

The data bank will be available from remote visual display units in the form of a dialogue between a user and the system. The quality and efficiency of the information output on statistics will be improved through the use of computers and photosetting machines in the technological process of preparing information publications. All this should assist in a more total use of scientific-technical information on statistics supplied on magnetic tapes from other information

centers of the USSR as well as from socialist country members of the International Information System for Social Sciences (MISON).

A detailed and effective study of the needs of various subdivisions and services of the organs of government statistics in actual aspects of scientific-technical information by the workers of the TsOONTI is an important factor in improving efficiency of the services of the scientific-technical information of the USSR Central Statistical Administration. Proposed plans of statistical work will serve as a base for organizing retrieval of necessary information. A direct connection with the workers of the USSR Central Statistical Administration, oblast, and kray organs of statistics should also be established, so that having studied their needs they can be provided with information according to specific inquiries.

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## LVOV OBKOM SECRETARY ON PARTY TASKS IN SCIENTIFIC, TECHNICAL PROGRESS

Moscow PARTIYNAYA ZHIZN' in Russian No 11, Jun 84 pp 22-27

[Article by V. Dobrik, first secretary of the Ukrainian Communist Party Lvov Obkom: "The Party Committee and the Introduction of Scientific and Technical Achievements"]

[Text] Under the conditions of intensification of the economy, problems of improving management methods in scientific and technical progress and the use of its achievements in practice become paramount. The urgency of solving these problems was underscored at the CPSU Central Committee February and April (1984) plenums. At a meeting with workers from the Moscow Serp i molot Plant, comrade K.U. Chernenko said: "At the present stage, retooling of the sectors and introduction of the latest achievement of science and leading experience are acquiring special importance. This is the urgent demand of the time, one might say the call of the epoch."

Acceleration in introducing the achievements of science and technology in production is a decisive factor in the steady growth of labor productivity. Convincing proof of this is offered by the course of socialist competition for above-plan improvements in labor productivity and reductions in the prime cost of output. The practical measures to carry out these extra party tasks in addition to the plan have been discussed at party committee plenums and in the primary party organizations and labor collectives of Lvov Oblast. As a result, most enterprises have adopted stepped-up pledges and are successfully meeting them. And in this a not insignificant role is being played by party organization control over the progress of matters on this very important sector.

During the first quarter of this year the oblast's industrial associations and enterprises overfulfilled the labor productivity plan 2 percent. And the enterprises in seven rayons and in Borislav city achieved the increase in the volume of output produced by improved labor productivity alone. Collectives participating in a large-scale economic experiment covering real return from the extension of independence and enhancement of enterprise responsibility, are working more successfully than others.

At the same time, it must be acknowledged that the high socialist pledges of the collectives have not in all cases been underpinned with the proper economic decisions, engineering support and economic calculations, and this is lowering



work results. During the first quarter 13 enterprises failed to cope with the labor productivity plan. We are also extremely worried by the fact that not all targets for the introduction of new equipment and technology have been met, because this exerts a direct effect on growth in social labor productivity: most of this growth at our enterprises is being achieved through scientific and technical progress.

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Guided by the decisions of the 26th CPSU Congress and subsequent CPSU Central Committee plenums, the Lvov party organization is paying increasing attention to tasks of improving the management of scientific and technical progress. Its field of vision includes questions concerning the further raising of the technical level of production and reducing lead times for the development of new equipment and introducing progressive technological processes and equipment. The party obkom is focusing the city and rayon party committees, soviets of working people's deputies, party, trade union and Komsomol organizations and associations and enterprises on solving these questions. Using various forms of party influence we are trying on a day-to-day basis to achieve increasingly complete and efficient use of the scientific and technical potential in the oblast. And the potential is significant. Take the sphere of science. About 11,000 scientific and scientific-teaching people are working in the 12 VUZ's and 37 sector and academy institutes and their branches. Much of our scientists' work is known far beyond the borders of the republic. Important research is being conducted, particularly in the field of the mechanics of deformed solid bodies, physicochemical mechanics and the biochemistry of agricultural animals.

Constant work is being done in industry to retool production and renew output, and to develop new mechanized and automated lines and comprehensively mechanize and automate sections, shops and production facilities. During the first 3 years of the five-year plan implementation of measures concerned with new equipment brought a saving of R150 million. Progressive technology is being introduced with increasing boldness. For example, at the Lvov Conveyor Production Association imeni 60-letiya Velikoy Oktyabrskoy sotsialisticheskoy revolyutsii and the Drogobych Drill Plant, low-oxidation heating of billets for pressing has been used, together with clinching iron and calibration of the billets. The Avtopogruzchik and Prikarpatpromarmatura production associations have comprehensively mechanized the processes of casting and welding of structures. Many machine-building enterprises are using an edging tool made from boron carbide [elbor] and other superhard materials to machine metals, together with curved rolled sections, and parts made from progressive plastics and fabricated using the methods of powder metallurgy. The Lvov biophysical instruments and milling machine plants and the Stryy Forging and Pressing Equipment Production Association have assimilated highly productive NC metal-cutting machine tools.

Of course, we could also cite other examples of the successful use of the achievements of science and technology and the assimilation of new output. Unfortunately, however, there are also negative facts. Sometimes the transfer of new articles to series production is being delayed so much that the articles become obsolete before they go into operation. It is understandable that such cases particularly worry us.

Thus, the assimilation of a new model of a diesel-powered city bus developed at the Lvov Bus Plant and which meets the highest present-day requirements in terms of its technical-economic parameters, is proceeding there with great difficulties. The reasons? The enterprise workers cite many of them. They include the low capacity of the pressing facility, poor instrument production, and inadequate help from the Ministry of the Automotive Industry. However, a large part of the blame lies with the plant managers and the plant party organization. The art of both economic and party leadership as applied to scientific and technical progress lies precisely in the ability to see the whole technical problem from idea to introduction, and to solve it sequentially at each stage. Now the party organizations at the plant and the Experimental Design and Technological Institute of the Automotive Industry have managed to draw up a clear-cut plan to prepare production for the series output of the buses. The course of assimilation of the model is being reviewed at party meetings and meetings of the plant and institute party committees. And this kind of anxiety on the part of the communist makes it possible to hope that the important task will soon be resolved.

Both the case cited above and others have alerted the party obkom to analyze more deeply the very practice of introducing scientific achievements in production. The obkom plenum that took place last year, at which the question of measures to further strengthen the influence of the party organizations on the acceleration of scientific and technical progress was discussed, has helped in revealing certain reserves. I think that the most important of these is that it has been possible to define more accurately and specifically than heretofore the points at which party efforts should be made in solving an important economic task. Some of these points are as follows.

Nonfulfillment of plans for the development of science and technology is largely explained by too little work on the part of the engineering and economic services. Plans are insufficiently oriented on solving the main tasks in the intensification of production. And the situation that prevails at a number of enterprises, in which questions of introducing new development are resolved without support from the plant design and technological sections (while the latter are loaded down with petty matters of organizing the fulfillment of current production tasks) in no way helps the acceleration of scientific and technical progress. The party organizations have focused the enterprises and association on the elimination of these kinds of shortcomings, obliging them to strengthen control over the activity of the administration in fulfilling plans for the development of science and technology. It has already been possible to correct some of them.

The oblast party organization is consistently resolving the most important questions determining the efficiency of social production and acceleration in scientific and technical progress, and it is doing much organizational and educational work to mobilize collectives to overcome the difficulties that arise. These tasks are regularly discussed in the party raykoms and analyzed by the party organizations at the enterprises, associations, and scientific research and planning and design institutes and establishments. Commissions that monitor the activity of the administration in introducing new equipment and improving output quality are operating in most party organizations. Lecturers, propagandists and agitators are making their own specific contribution

in insuring that lead times are cut in the development of advanced equipment and the introduction of progressive technological processes. The mass information media and visual-aid agitation and large-circulation press and wall-poster information workers are activating their work on this sector.

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The oblast party committee is setting as a paramount task for party and public organizations, economic leaders, communists and all workers in the oblast the comprehensive approach to the problem of accelerating scientific and technical progress. It is precisely on this that the CPSU Central Committee and USSR Council of Ministers decree "On Measures To Accelerate Scientific and Technical Progress in the National Economy" is orienting party and economic organs and scientific and production collectives. This document underscores the importance of skillfully combining sector and territorial management of scientific and technical progress for the development and implementation of goal-oriented comprehensive scientific and technical programs. It is precisely this that makes it possible to combine the efforts of the enterprises and organizations of different departmental subordination located in the same region to make better use of their scientific and technical potential.

In accordance with the instructions of the 26th CPSU Congress and subsequent CPSU Central Committee plenums on enhancing the role of local party organs in the management of scientific and technical progress, consistent work is also being done in our oblast. Together with the Ukrainian SSR Academy of Sciences Western Scientific Center, the party obkom has implemented measures to formulate a specific system for managing scientific and technical progress. Its main components include the interdepartmental scientific-production complexes and the interdepartmental goal-oriented scientific-production associations.

The interdepartmental associations are being set up for a time to implement a goal-oriented program. One essential condition is determining the head organizations for carrying out scientific research work and test-and-design developments, and introducing them. An agreement and statute are confirmed by the ministry to which the head organization is subordinate. Thus, the sector principle in management is observed. The practical activity of the goal-oriented association, however, is guided by a scientific and technical council whose makeup includes fully empowered representatives of the establishments and production associations in a region, subordinate to different departments. The council effects start-to-finish planning and control over the fulfillment of work, from the start of research to the introduction of its results in production. The most active of these interdepartmental goal-oriented scientific-production associations are the "Avtoprom," "Nedra," "Ekran" and "Medelektronika." The "Ekran" Association, for example, is successfully implementing a goal-oriented program to improve the quality of cathode-ray instruments.

The next step in the quest for a better combination of sector and regional management in scientific and technical progress in the oblast was the creation of the interdepartmental scientific-production complexes, which include groups of interdepartmental goal-oriented associations. The party obkom and the



Western Scientific Center saw in this form of management new opportunities for expanding cooperation between enterprises and organizations. Management organs for the complexes have also been set up--the collegiums. They are led by the chief scientists involved in the corresponding range of problems. And officials from the the sector sections of the party obkom are included as the deputy chairmen of the collegiums.

By participating directly in the work of these public management organs the representatives of the party obkom exert great influence on agreed decisionmaking by numerous partners. They consistently strive to achieve a common line in the acceleration of scientific and technical progress. The councils of secretaries of primary party organizations at enterprises included in the goal-oriented associations also serve to improve the effectiveness of introduction of completed developments in production and to break down the interdepartmental barriers. In these kinds of organizational forms the obkom has found one way of exerting effective party influence on the accelerated integration of science and production.

The party obkom buro and secretariat systematically analyze and direct the activity of the collegiums of the goal-oriented scientific-production complexes. When necessary the appropriate party decisions are adopted in support of recommendations put forward by the collegiums. True, this need does not often arise because as a rule the proposed measures are very well thought-out and justified. They are oriented on the final national economic result and properly consider the interests and possibilities of the parties involved. And herein we see one of the indisputable advantages of the interdepartmental complexes.

As a result of the functioning of the scientific-production complexes and associations the interaction has become more harmonious between the academy and sector scientific research institutes, the VUZ's, and the industrial enterprises and associations in the implementation of the goal-oriented programs. Seven complexes, which include 30 scientific-production goal-oriented associations, are now operating successfully in Lvov Oblast. Their efforts are being focused primarily on the development and assimilation of essentially new kinds of output, materials, and low-resource and other progressive technologies, reducing manual labor, and the mechanization and automation of labor-intensive production processes.

Thus, the collegium of the machine-building complex was the initiator in the development of a highly efficient rock-smashing tool for the coal industry and the assimilation of its production at the Drogobych Drill Plant. A test batch of cutting tools for imported drilling installations has been developed and fabricated. Industrial tests have shown that the test tool is as strong and can penetrate as far as the best products from foreign firms. According to figures from the Ukrainian SSR Ministry of the Coal Industry, the annual saving derived from cutting back on purchases of this tool abroad will be about R1 million.

Completing this work in the short period of 2 years has become possible thanks to the active position taken in questions of accelerating scientific and technical progress by the party committees at the Drogobych Drill Plant and the Ukrainian SSR Academy of Sciences Physical Mechanical Institute imeni G.V.



Karpenko, and the head organizations of the "Nedra" interdepartmental goal-oriented scientific-production association.

The plant party committee pays constant attention to the development of sector science in production. On its initiative, as long ago as the start of the 10th Five-Year Plan a sector scientific research laboratory was set up on the basis of cooperation with scientists and specialists at other enterprises in order to improve the quality and reliability of drilling bits. Through the efforts of the party committee an atmosphere of high responsibility on the part of economic leaders and specialists has been created for the timely introduction of scientific achievements in practice. This is promoted in large measure by the fact that in exercising control over the activity of the administration, one of the main criteria for evaluating worker conformity with their duties has become the attitude of the worker toward technical innovations and his desire to improve production. At the plant the use of material and moral incentives for the acceleration of scientific and technical progress is under the constant control of the party organization. As a result, developments from the laboratory and from other scientific organizations are implemented in the plant shops with any delay.

The successful activity of the interdepartmental scientific-production complexes and goal-oriented associations is shaped largely by the support for our quest received from the Ukrainian Communist Party Central Committee and the help given by the presidiums of the USSR Academy of Sciences and the Ukrainian SSR Academy of Sciences. In order to spread the experience gained in regional management of scientific and technical progress, an all-union seminar on the subject of "The Integration of Science and Production under the Conditions of Developed Socialism" has been held in Lvov.

The forms of cooperation that we apply between the scientific and the production organizations possess considerable advantages. At the same time we do not think that they are the ultimate. They require further development, scientific substantiation, and normativ and methodological reinforcement. Many problems must be solved in order to implement the measures to strengthen the effect of economic levers and incentives on the acceleration of scientific and technical progress in light of party demands on improving the economic mechanism.

Neither are the interdepartmental complexes totally free of defects. For example, at present they are solving few of the problems facing small and medium-sized plants. These plants are in particular need of help from the leading scientists and specialists. Bringing the equipment and technologies at such plants up to the necessary level is a most urgent task. The obkom is now orienting the collegiums of the complexes and the party organizations on this.

The creation in the party obkom of a council for influencing scientific and technical progress has imparted a certain completeness to our system of party influence on strengthening the links between science and production. Similar councils have been set up in the party gorkoms and raykoms, taking into account their specific tasks. Scientists and specialists have been recruited to the work. Public councils provide help for the party organizations and labor

collectives in developing and implementing the goal-oriented comprehensive programs, and they offer support for the qualified analysis and search for ways to resolve overdue tasks in scientific and technical progress. We think, however, that not everything has yet been properly organized in their activity, and parallelism and duplication are sometimes permitted. The party obkom is studying the practical work of these organs so as to improve it and perfect the system.

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Even when there is a well-tuned mechanism for managing scientific and technical progress, success in realization of its achievements depends on personnel, on the people participating in this process. As comrade K.U. Chernenko said at a meeting with voters: "Ultimately, people are essential in any endeavor, and it is people who bring renown to the endeavor. And this ancient truth applies also to scientific and technical progress."

While taking care of the implementation of the goal-oriented comprehensive scientific and technical programs, the party organizations, raykoms, gorkoms and party obkom are devoting increasing attention to strengthening the leading sections with skilled specialists and experienced organizers, and they are enhancing exactingness toward cadres for the timely introduction of the results of scientific and technical achievements in production and decisively cutting short any manifestations of formalism, inertia and irresponsibility in this important matter.

Bringing these people onto the strength of the party committees has enabled better study and analysis of the qualities of leaders and specialists in organizations, enterprises and establishments included in the interdepartmental scientific-production complexes. Personnel are being moved about with the aim of strengthening the most important sections of production and science. During the first 3 years of the present five-year plan 21 directors and 7 chief engineers have been relieved of their duties. Extreme measures, but necessary. In many cases the replacements were made because of leaders' failure and their inability to meet scientific and technical progress head on, and to see and uphold and introduce into production what is new and advanced, and from these positions to select and indoctrinate their subordinates.

For several years the organization of production, technological discipline, and the maintenance of gear and equipment had been low at the Lvovkhimsel'mash Production Association, and an acute shortage of skilled personnel was being experienced. This had come about largely because the former leader of the association attached no significance to production retooling and product renewal. As a result, many articles that were being produced were obsolete.

Early in 1983 the party obkom issued a decision on strengthening management in this association. A skilled specialist and principled and skillful leader, party member R.M. Zaverbnyy, was recommended for the post of general director. And we became aware of how much a worker can do when he is constantly searching and is able to take a justified risk in the interests of the matter. Now the products list for the articles produced by the association has been renewed and updated. A start has been made on the expansion and reconstruction of

the enterprise. Each month the plan for contractual deliveries is fully fulfilled. And compared with 1982, in 1983 labor productivity rose 22.6 percent. Convincing results.

Measures adopted by the party obkom and the gorkoms and raykoms on the organizational-political strengthening of the primary party organizations are promoting a restructuring in the management of scientific and technical progress. Nine party committees, 68 shop party organizations and 276 party groups have been set up in 87 party organizations at establishments and enterprises included in the scientific-production complexes. There have recently been substantial increases in the numbers of communists working in these establishments and enterprises, including doctors and candidates of science.

The party gorkoms and raykoms and the primary organizations have gained definite experience in work with scientific and engineering-technical personnel. Questions of enhancing the vanguard role of communists in all spheres of scientific and production activity have been discussed systematically at party meetings. Talks between managers and specialists have become a tradition, and when hearing the accounts and reports more attention is being given to strengthening the role of engineering-technical personnel in improving production efficiency and work quality, and to instilling in them a sense of high responsibility for the acceleration of scientific and technical progress. Of course, we consider these tasks to be linked directly with the development of initiative and a sense of enterprise and the rise in the professional, political and cultural levels of the workers.

Plans for the social development of the enterprise collectives, and also the skillfully drawn-up personal creative plans for the workers, are exerting a marked effect on the acceleration of scientific and technical progress. As is known, under present conditions equipment becomes obsolete more quickly. This makes special demands on increasing people's knowledge and the knowledge of those engaged in the organization of production and the maintenance of machines. Theoretical retraining for engineers, workers and employees should outstrip the renewal of equipment and technology. Appropriate planning for training and worker skill enhancement makes it possible for the collectives to be fully armed with knowledge when approaching the resolution of the new and complex tasks connected with retooling and the introduction of advanced technologies in production. And of course, in their activities the party committees and party organizations are obliged to take all this into account.

Continuing work to improve the management of scientific and technical progress, the party obkom buro has confirmed a comprehensive plan for helping in the development of science and technical progress in this field for the 11th Five-Year Plan and for the period through 1990. Guided by this plan the primary organizations have specified their own tasks as applicable to the conditions of the enterprises, establishments and VUZ's. A clear vista ahead and systematic analysis of work make it possible to consistently improve practical work in introducing scientific and technical achievements and leading experience in production and to switching the economy more decisively onto the rails of primarily intensive development.

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## FORECASTING, LONG-RANGE PLANNING OF S&T PROGRESS IN LATVIAN SSR

Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR in Russian No 4, Apr 84 pp 3-7

[Article by Deputy Chairman of the Latvian SSR Council of Ministers and Chairman of the Latvian SSR Gosplan Miyervaldis Leonidovich Raman: "Forecasting and Long-Range Planning of Scientific and Technical Progress in the Latvian SSR"]

[Text] The scientific and technical revolution confronts the national economy with ever more important, complex and, in many respects, new tasks. As was noted at the December, 1983 Plenum of the CPSU Central Committee, success in resolving them depends on how we mobilize the collectives of enterprises and of scientific research and design organizations and engineering, technical and scientific personnel towards accelerating scientific and technical progress.

The Latvian CP Central Committee and Latvian SSR Council of Ministers decree "Measures on Accelerating Scientific and Technical Progress in the National Economy of the Latvian SSR", which was approved in 1983 on the basis of the appropriate union document, is a specific program for the republic in this direction.

As was noted in this decree, a fundamental improvement of all work by the acceleration of scientific and technical progress and thereby by a cardinal increase in labor productivity must occur on the basis of consistent execution of a single scientific and technical policy, further development of scientific research, intensification of the integration of science and production, and extensive and accelerated implementation of the achievements of science and technology.

One can still add to this most important item of scientific and technical progress a directive from the CPSU Central Committee and USSR Council of Ministers 1968 decree "Measures on Increasing the Effectiveness of the Work of Scientific Organizations" concerning the necessity of systematically developing scientific and technical forecasts for a protracted period (10 to 15 or more years), and which must be the basis for selecting the most long-range trends of technical progress and effective ways for development of the national economy and its individual industries and the basis for developing a comprehensive program of scientific and technical progress.



In connection with this one should be reminded of the well-known cycle of forecast--concept--plan and note that, according to the opinion of many Soviet scientists, a system of national economic forecasting consists of scientific-technical, demographic, social and economic forecasting and a forecast of natural resources.

One may note as well that in a time aspect a forecasting system is divided into short-term, medium-term and long-term forecasting. Scientific and technical forecasting is among the long-term ones, its task is to forecast the basic trends of scientific development, and its key achievements and their possible use proceeding from:

- an applied scientific and technical forecast, i.e. the use of that which is already created by science and technology, and

- a forecast of the fundamental trends of science and technology.

In this case it should be emphasized that a forecast does not substitute for the plan, but creates the scientific prerequisites for shaping it and it has three functions:

- analyzing objective tendencies in the development of new occurrences of problems and contradictions that have arisen,

- envisaging and evaluating the possible trends of future development, their rate and durability, and

- determining the possibilities of influences on the process of objective development.

In the Latvian SSR forecast evaluations of this kind were worked out with the compilation of food, energy and a number of other comprehensive programs prior to commencing that or other research. Nevertheless, it should be recognized that the depth of forecasting is still far from sufficient.

A comprehensive program of scientific and technical progress was worked out in the republic twice already, in 1978 and in 1983, on the basis of reference material of the USSR Academy of Sciences, GKNT [State Committee for Science and Technology] and other union organs, and local developments and proposals.

The development of science and scientific-technical progress in the 14 sectors and trends of the republic's national economy was defined in the comprehensive program. Problems and scientific-technical trends, in accordance with which specifically comprehensive socioeconomic and scientific-technical programs will be created for the 12-th Five-Year Plan, were more precisely defined simultaneously with development of the program. A list of them was proposed.

At the same time, it's necessary to note that the comprehensive program doesn't satisfy us completely. Well-known scientific and technical solutions, and not a single year, prevail in a number of its sections. New manufacturing methods are insufficiently stipulated in it and which are capable of radically changing

the usual stereotypical production processes and providing a cardinal increase in labor productivity as required by the CPSU Central Committee and USSR Council of Ministers decree of 1983 and decisions of the December, 1983 and special February, 1984 plenums of the CPSU Central Committee.

Therefore at the present time, when a decision has already been reached concerning the development of studies on the next comprehensive program of scientific and technical progress until the year 2010, it's necessary to analyze the state of work in a special and profound manner both according to forecasting and compiling a long-term comprehensive program so that in content it conforms to the high requirements of the indicated CPSU Central Committee plenums at which it was noted that for the time being organization of the entire complex of scientific and technical studies is far from being set aside and the scale of plans leaves much to be desired, and it was emphasized that intensification, accelerated incorporation into production of the achievements of science and technology, and the implementation of large comprehensive programs are the basic development trends of our economic system.

However, in spite of the mentioned shortcomings, a concept for developing the national economy of the Latvian SSR until the year 2000 was developed as far back as 1982. It was approved by the bureau of the Latvian CP Central Committee and ratified as a basic document by the republic's council of ministers. Together with the comprehensive program of scientific and technical progress and the distribution diagram for productive forces, it is the basis for developing the basic trends of economic and social development for the 12th Five-Year Plan and for the period until the year 2000.

For the first time 11 republic scientific and technical programs were developed and included as a part of the plan of the 11th Five-Year Plan. These programs had the objective of leading to important scientific results that were obtained in institutes of the Academy of Sciences, VUZ's and the republic's industrial institutes and to wide application in production. Thus for the five-year plan the republic outstripped the execution of last year's decree concerning the inclusion of programs of this kind in the five-year plans of economic and social development and today the experience of program-specific planning and management as well in the area of scientific and technical progress is being accumulated, and the decree mentioned above requires that also.

For example, one should note the successful execution of republic scientific and technical programs such as these:

"The creation of automated processes for planning, production preparation and the production of industrial equipment." As a result of executing the program measures, an automated system for the industrial preparation of tool production is in industrial operation at two of the republic's large enterprises: "VEF" RPO [republic industrial association] and "Radiotekhnika" PO [industrial association]. For example, this made it possible at the "Radiotekhnika" PO to reduce twofold the number of those involved in this work. The system is undergoing experimental industrial operation at the "Kommutator" plant.

"The creation and introduction of microprocessing management and control systems." As a result of executing the program measures, 20 microprocessing systems and 30 microcomputers, which are being used already for controlling the production of radio and communications equipment and are being reproduced as well by other organizations on a contractual basis, were manufactured in 1983 at the "VEF" RPO.

The incomplete execution of some other programs is basically associated with difficulties in financing and allocating the required equipment. These difficulties can and must be overcome with great persistence.

A high level of inventiveness, its utilization in production, and the sale of licenses on this basis are an important component both for long-range planning and development and for accelerating scientific and technical progress.

As far back as 1979 through the decree on "Measures in Further Improving Inventor's Matters in the Latvian SSR and Intensifying the Role of Inventions for Increasing Production Efficiency" the Latvian SSR Council of Ministers required ministries, departments and the Academy of Sciences "to increase exacting requirements towards scientific research institutes and planning and design organizations and enterprises on the part of creating machines, equipment, instruments, and industrial processes and materials that in accordance with their technical and economic indicators outstrip the achievements of modern world technology by 10 to 15 years." This requirement is being executed in an insufficient manner, although today it has assumed much greater poignancy. Only a third of the scientific and technical developments being performed in the republic contain technical solutions on the level of inventions.

The technical and economic level of any product piles up during the course of its development. If the designers make up their minds to exceed the indicators of the best models, then their way to this begins with a patent search. Then it becomes clear also that in world technology it's possible to consider what ideas are advisable to take on and what problems will require original technical solutions as a stage that has passed already.

Hence it's evident that the technical and economic level of the products being created can be forecast and this process can and must be managed.

However, as before an objective evaluation of the technical level of design operations that are performed by subdepartmental organizations is absent in the evaluative materials of a number of ministries--agriculture, local industry, meat and dairy industry, and domestic services. The creation of inventions, their significance, and the patentability of the subject as a whole was taken into consideration only by the Ministry of Health in the line of developing new instruments and by individual institutes of the Academy of Sciences when evaluating developments.

The fact that out of 1,473 developments introduced during the course of a year only 25 (3 percent) contain their own inventions is indicative of insufficient

novelty and thus of the low technical level of developments that were performed in 19 scientific research, planning and design, and industrial organizations of the republic.

One should speak separately about the level of the inventions themselves. Their influence on the technical policy of the industries is obviously insufficient with the relatively large number of copyrights (83 per 1,000 scientific workers) that were received for the 1980-1983 period.

There are extremely few inventions that promote the creation of competitive products and modern manufacturing methods in those industries and trends that are traditional for the republic like radio production and telephony, instrument manufacture, food and light industry, and the building materials industry.

Radio equipment of the "VEF" and "Radiotekhnika" associations, with the exception of an acoustical system, has insufficient competitiveness because of lags in technical level and appearance.

To a greater or lesser degree one can make complaints as well about the insufficient competitiveness of products of the "REZ" PO, the Riga illumination engineering plant, the "Al'fa" PO, the Riga electrical lamp plant, the Daugavpils "Elektroinstrument" plant, the "Elektrostroyinstrument" PO and others.

At the same time, here's the latest example: the creation of new sleighs for a bobsled, and ones which clearly exceed the best world models according to their technical data, by specialists of "VEF" and a number of other organizations.

An invention is a high technical level of development, rapid industrial utilization of these results, and well-founded legal protection of them abroad. The final result of this chain is a competitive product and licensing in the foreign market.

At the beginning of 1984, 18 licenses were sold by organizations of the republic and, moreover, all the agreements were concluded on the basis of developments of only some of the republic's Academy of Sciences Institutes: Organic Synthesis, Microbiology imeni August Kirichenstein, and Physics and Chemistry of Wood.

A considerable reserve for accelerating scientific and technical progress, including increasing the technical level and competitiveness of industrial products, is contained in well thought-out scientific and technical cooperation with the country's scientific organizations and foreign research centers.

Some institutes of the Academy of Sciences, leading VUZ's of the republic, scientific institutions of the Ministry of Health and some others are performing joint developments with foreign organizations, basically within the limits of the coordinated plans for NIR [scientific research work] of the SEV [Council for Mutual Economic Assistance] countries.

While taking into consideration the volume of scientific research, the skill of the republic's scientists and specialists, and the possibility of developing



scientific and technical cooperation, one can affirm that potential opportunities in the sale of licenses among the republic's organizations are incomparably greater than the results that were achieved.

It is necessary to implement the following measures in the republic for increasing the rate of scientific and technical progress and the efficiency of public production in light of the decisions of the December, 1983 and special February, 1984 Plenums of the CPSU Central Committee:

--to examine in detail here the state of forecasting scientific and technical progress, to outline specific measures for improving it, and to determine the organ handling this problem. Obviously it's advisable to create interim groups of scientists and specialists on the national economy for developing one forecast or another,

--to critically examine the Latvian SSR comprehensive program for scientific and technical progress until the year 2005, to determine its weak spots, and to take them into consideration when developing a program of this kind for the next period with a considerably more extensive enlistment of scientific collectives and specialists of other organizations located on the republic's territory,

--while implementing the development of scientific and technical programs for the 12th Five-Year Plan, without fail to provide for complete coordination of the measures stipulated in them with other sections and tables of the plan for social and economic development and so that the necessary resources of all kinds will be completely balanced. In executing these programs that were developed for the 11th Five-Year Plan, to search for ways for drastically improved and timely fulfillment of the outlined program measures, an increase in the responsibilities of development workers and the provision of appropriate stimulation for a qualitative, high-resultant and timely fulfillment of the measures,

--to develop comprehensive plans for the retooling of industries and separate industrial projects. To constantly work on automating industrial processes on the basis of using automated machine tools, machines and mechanisms, standardized equipment modules, robototechnical complexes and computer equipment. To concentrate efforts on accelerating the creation of flexibly automated factories and automated planning systems that provide a cardinal increase in labor productivity and a sharp reduction in the share of manual labor,

--to establish in all industries of the national economy an efficient procedure of operations for planning the protection abroad of inventions and industrial models and trademarks that is coordinated with the plans for NIOKR [scientific research and experimental design work], export and the sale of licenses.

--to constantly improve the scientific and technical information system, including on the basis of automated systems, and while devoting particular attention to the operational informational flow concerning the world level of technology for forecasts and long-range planning and modern manufacturing methods and designs that have been assimilated or that are ready for assimilation, and

--mass information organs are to systematically publish materials on scientific and technical achievements and the problems of accelerating and increasing the efficiency of scientific and technical progress.

Acceleration of the rates of scientific and technical progress is a priority task that is being accomplished in many respects by resources of the planning mechanism. While fulfilling it, we will promote realization of the historic decisions of the 26th CPSU Congress and its subsequent CPSU Central Committee plenums.

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## MODERNIZATION OF UKRAINIAN MACHINE BUILDING EQUIPMENT DISCUSSED

Kiev EKONOMIKA SOVETSKOY UKRAINY in Russian No 1, Jan 84 pp 60-65

[Article by B. Kryzhanovskiy, candidate of economic sciences: "The Status of and Prospects for the Modernization of Equipment in Machine Building in the Ukrainian SSR"]

[Text] One important direction in improving production efficiency is the modernization of existing equipment, that is, its improvement for the purpose of eliminating obsolescence and raising technical-economic parameters to the level of present-day requirements. Modernization of existing equipment is divided into general technical modernization and technological (goal-oriented) modernization. General technical modernization consists of bringing technical-economic parameters in line with the indicators for the most advanced machines of similar production designation. Technological modernization presupposes the expansion of equipment's technological possibilities, change in its basic designation, automation of the processing cycle and so forth. It may also be carried out for the purpose of creating continuous-flow mechanized and automated lines made up of updated machines and units. It is also customary to distinguish partial and comprehensive modernization. In partial modernization individual technical-operational indicators for equipment are improved, while in comprehensive modernization obsolescence of the second form is fully eliminated.

Equipment modernization is associated with definite expenditures and consequently with the need to determine its economic effectiveness. The following are the main indicators for the economic effectiveness of modernization: capital investments necessary to carry out the modernization, the prime cost of output before and after the modernization, the pay-back times and their corresponding coefficients of effectiveness, and the labor productivity of the workers. Expenditures on the modernization of existing equipment are funded in industry through amortization deductions for capital repairs, the enterprise (or association) production development fund, and bank loans. The adequate number of funding sources and the relatively high economic effectiveness of modernization are resulting in increases in the scales on which modernization is carried out in all sectors of industry. Thus, whereas during the 8th Five-Year Plan an average of 135,000 units of production equipment were modernized each year in USSR industry, during the 9th Five-Year Plan the figure was 146,000, and in the 10th Five-Year Plan, 177,000, that is, increases of 31 percent and 21 percent respectively. During the period 1966-1980 the scales of modernization

in the chemical, petrochemical and food industries grew by a factor of 1.9, while in the construction materials industry the figure was 2.2.\*

Within the Ukrainian SSR machine building a large inventory of equipment of various designations is now being operated, and each year a definite proportion of it is modernized. The trend toward increasing scales of modernization is marked. During the period 1971-1980 the amount of updated technological equipment rose by a total of 19.7 percent, including 28.8 percent for metalworking machine tools, 67.2 percent for forging and pressing machines, and 18.8 percent for casting equipment. Taking into account the fact that modernization is accompanied by qualitative improvements in machines, improvements in their technical-operating characteristics, and improvements in work comfort for machine tool operators, it must be recognized that this trend toward increased modernization is a positive one. Quite significant differentiation also occurs in the scales on which the equipment in any given technological groups is modernized.

The rate of modernization for special and specialized metalworking machine tools, hydraulic presses, metalware equipment and machines for casting and other casting equipment is relatively high. In contrast, for some kinds of metalworking machine tools (turning lathes, turret lathes, boring machines), and for forging machines, hammers and other technological equipment, modernization is carried out at slower rates. A definite disproportion also exists in the structure of the available inventory and of the updated inventory. Thus, whereas as part of the total inventory, metalworking machine tools make up about 63 percent, the proportion of updated machines is 46.3 percent; for woodworking equipment these indicators are 3 percent and 1.3 percent respectively, for casting equipment 3.7 and 5.4 percent, for forging and pressing equipment 15.1 and 15.2 percent, and for other technological equipment 15.7 and 31.8 percent. This indicates a need to increase the scales of modernization for metalworking equipment, especially turning lathes, turret lathes and boring machines, and also forging machines, hammers and some other kinds of metalworking equipment.

The scales of modernization for existing machines and equipment in machine building in the Ukrainian SSR still do not fully meet the requirements of the present-day scientific and technical revolution or what is actually feasible in production. In 1981 only 1 percent of the total inventory of production equipment was modernized, including 0.9 percent of metalworking machine tools, 1.5 percent of forging and pressing machines, 0.7 percent of casting machines, and 0.6 percent of woodworking equipment, while the total requirement exceeded 6 percent (taking into account acceleration in the rates of scientific and technical progress and the renewal of machine building output). In 1981 the proportion of expenditures on the modernization of equipment as part of total expenditures on the technical development of machine building enterprises located on the territory of the Ukrainian SSR, was only 1.8 percent, including 1.6 percent for the enterprises of the USSR Ministry of the Electrical Equipment Industry, 1.2 percent for the USSR Ministry of Machine Building for Animal Husbandry and Fodder Production, 1.1 percent for the USSR Ministry of the Automotive Industry, 0.8 percent for the USSR Ministry of Machine Building for Light and Food Industry and Household Appliances, 0.7 percent for the USSR

\* "Narodnoye khozyaystvo SSSR v 1980" [The USSR National Economy 1980], Moscow, "Finansy i statistika", 1981 p 102.



Ministry of Construction, Road and Municipal Machine Building, and 0.1 percent for the USSR Ministry of Instrument Making, Automation Equipment, and Control Systems. These expenditures exceeded the average for the sector in only four of the machine building ministries (the USSR Ministry of Power Machine Building--1.9 percent; the USSR Ministry of the Machine Tool and Tool Building Industry--2.8 percent; and the USSR Ministry of Chemistry and Petroleum Machine Building and the USSR Ministry of Tractor and Agricultural Machine Building--3.5 percent each). For comparison we point out that in all industry in the UkSSR the proportion of expenditures on the modernization of machines and equipment was 5.2 percent, of 2.7 times more.

The calculations have shown that the modernization of existing equipment usually insures a substantial economic effect. Thus, for the period 1971-1981, the economic effect per ruble of expenditure on the modernization of all equipment in all the machine building enterprises of all-union subordination located on the territory of the UkSSR varied between 0.76 and 1.09, while the pay-back time varied between 0.9 and 1.3 years.

Work to modernize equipment is being carried out on substantial scales in the USSR Ministry of Tractor and Agricultural Machine Building. Thus, during the period 1971-1975, some 2,720 units of equipment were updated at enterprises of this ministry located in the UkSSR, while in the period 1976-1980 the figure was 5,109 units, and in 1981 another 828. And during the course of modernization the following technical tasks were resolved: reducing machine time--1,268 units (16.2 percent); reducing time spent on auxiliary operations--2,411 units (30.8 percent); altering the technical designation--806 units (10.3 percent); extending technical possibilities--399 units (5.1 percent); improving accuracy--1,026 units (13.1 percent); improving reliability and prolonging service life--1,151 units (14.7 percent); saving materials used for maintenance and operating needs--768 units (9.8 percent).

The experience gained by many machine building enterprises in the republic testifies to the quite high effectiveness of modernization of production equipment.

At the Megommetr Plant in Uman the drilling of holes 6.7 millimeters in diameter during the fabrication of pipe blanks for pressure springs made from 50KhFA steel has been done in recent years with hard-alloy hammer drills mounted on 4SM horizontal drilling machines. In order to switch these machines to a more productive drilling method using one-way hard-alloy drills employing an externally fed coolant and lubricant with internal removal of the shavings, during the 10th Five-Year Plan the headstock and tailstock, the support and the pump were updated. As a result of this modernization of the machines a stable process was insured for the drilling of deep holes using hard-alloy drills. And productivity in the drilling process was almost doubled, maintenance standards for the machines were improved, and labor safety was enhanced.

Extremely effective work to modernize the KhA-118 machine tool units for drilling the lateral seatings in the M18-M20 thread-cutting dies was carried out at the Ukrainian State Design and Technological and Experimental Institute for the Organization of the Machine Tool Industry instrument plant in Kharkov. Before this was done the blanks were mounted in a jig and secured to the frame

by hand, which required a considerable amount of time. As a result of the modernization the process of mounting the blank was mechanized and it became possible to install four standardized unit heads instead of two. Machine productivity almost trebled from 130-140 to 400 thread-cutting dies per hour.

Modernization of equipment at the Novokramatorsk Machine Building Plant imeni V.I. Lenin is being carried out on broad scales. Here, special attention is being paid to the technological modernization of metalworking machine tools and forging and pressing equipment. As a rule, at this plant raising the productivity of the obsolete models of machine tools and equipment is insured mainly through increasing their capacities and operating speeds in metalworking, combined with improvements in individual units and parts, and also as the result of installing devices that reduce the time taken for auxiliary operations.

Together with the Novokramatorsk Machine Building Plant imeni V.I. Lenin, the Kramatorsk Scientific Research Planning and Technological Institute of Machinery Manufacture had developed a special method for updating vertical lathes by means of switching them to the use of a hydrostatic lubricant. For this purpose, special chambers into which the lubricant is fed under pressure by a pump have been mounted on the guideways. Experience shows that the modernization of heavy-duty vertical lathes model 1556 during capital repair does not require major expenditures and does not actually increase maintenance costs, while the effect obtained from doing this is substantial: the time between maintenance is doubled or tripled, the movement is smooth across the entire range of speeds, the surface of the machined part is cleaner, and the average annual saving per machine is R3,000 to R5,000.\*

Analysis of the work of many maintenance services at the machine building enterprises in the republic indicates that modernization should be regarded as an effective means of improving equipment when wear is slight. It is precisely here that the advantages of design improvements to machines are seen most fully: relatively low capital expenditures and short pay-back time. For example, in 1979, one of the 6N82G horizontal milling machines in the mechanical shop at the Lutsk Automobile Plant was equipped with a semiautomatic attachment for milling disk teeth. The cost of this machine, which was produced before 1970, was R1,900, and the additional costs of modernization amounted to R500. As a result of the improvement in this machine it was possible to reach a productivity equal to that of the new YeZ-20 semiautomatic machine tool, which costs more than three times as much as the 6N82G (R7,200). Thus, the economic effectiveness of such work in updating machine tools is obvious.

The experience gained by the No 8 State Bearing Plant (Kharkov) in the modernization of semiautomatic lathes is interesting. At this plant the semiautomatic lathes have been equipped with feed devices (automatic operators), and as a result workers operating the equipment no longer need to carry out tiring, monotonous movements repeated over and over throughout the course of

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\* "Effektivnost' tekhnicheskoy bazy mashinostroyeniya" [Efficiency in the Technical Base of Machine Building], Kiev, "Tekhnika", 1981, p 54.

the day. And injuries caused during the manual mounting and removal of rings have been completely eliminated. The use of these automatic operators has greatly raised production standards and has improved labor productivity 25 percent among workers and extended the opportunities for multiple-machine servicing. Following the completion of modernization at the plant, automatic continuous-flow lines in the ring turning and grinding sections were set up and are now functioning successfully. Expenditures on the modernization of this equipment were recouped in less than 2 years.

Analysis of the status of work on the modernization of metalworking equipment in machine building in the republic has shown that during the course of such modernization it is mainly the following technical tasks that are resolved: increasing torque, cutting power and the rate of revolution for the spindle, improving the reliability and productivity of machine tools, and machining accuracy. This is achieved mainly by installing extra high-speed, more powerful spindles and thyristor drives with a wide, stepless range of regulation, using electromagnetic couplings, replacing relay protection elements with more modern designs, making extensive use of bearing and roller bearing guide bearing shells, equipping machine tools with press-fit variable stops, mechanizing protection and centering devices using pneumatics or hydraulics, and installing high-speed, multiple-position devices for attaching tools.

Along with the modernization of metalworking machine tools in machine building in the UkSSR, the modernization of forging and pressing and foundry equipment is being carried out on a large-scale. The updating of hydraulic presses has been especially effective. As is known, the existing structures used to seal the upper part of the cylinder in the P474A, P474G and PD476 models, which are used extensively in machine building plants, have a number of shortcomings, and this affects operating characteristics. At the Kiev Bolshevik Plant and the Berdichev Progress Plant, in order to eliminate these shortcomings these models of presses were modernized, and as a result sealing reliability was improved and the fabrication of parts and the mounting of assemblies were simplified. At the same time equipment down-time for planned and nonplanned maintenance was cut 20-25 percent, and costs on technical servicing between maintenance schedules were reduced.

At the Kremenchug Automobile Plant, in 1978 the model K863 hot-stamping press rated at 1,000 tons-force was modernized in order to prolong the length of the maintenance cycle and reduce expenditures on servicing between maintenance schedules: the kinematic layout of the press was simplified, the intermediate shaft and gear-train assemblies were removed, the number of slide strokes was increased from 60 to 80 per minute, the design of the clutch was improved, and a number of other design changes were made. Despite the relative complexity of the modernization work its effectiveness was high. The annual saving derived from lower production costs is R85,000 and the pay-back time was 1.5 years. And five workers were freed up, while additional output worth about R12,000 was produced.

The experience gained by the Inepropetrovsk Metallurgical Equipment Plant, the Konotop Krasnyy metallist Plant and the Pervomayskiy Agricultural Machinery Plant (in Berdyansk city) in foundry modernization is also of interest. Up to now during drying of the dipper stops in the shaped-steel foundries of these



plants they have used vertical drying chambers with an internal diameter of 1,590 millimeters. In terms of design they were imperfect, and this used to exert an adverse effect on the economics of the process and reduce the efficiency of foundry production in general. In order to eliminate these shortcomings, during the course of the modernization the cast iron cover of the dryer was replaced with a steel cover (35L steel), with continuous slits rather than holes. These slits are covered by the slings mounted on the stops, and as a result the capacity of the dryer and its productivity were increased by a factor of 2.4-2.5; consumption of natural gas following modernization of the dryer remained unchanged but, calculated per stop, it was reduced from 37.7 to 16.5 cubic meters. Working conditions for the foundrymen were significantly improved, and the amount of gas in the air of the foundries was reduced.

The DSP-1.5 smelting furnace, which has a number of fast-wearing assemblies (for example, the lifting and lowering mechanism for the electrodes, which consists of a system of blocks, cables and drives with friction winches), is operated in some of the foundries in machine building plants in the UkSSR. This device breaks down with extraordinary rapidity, and so at some plants they have replaced it with a screw-driven device. In addition, in order to prolong the service life of the lining, during the course of the modernization of the electric arc furnace the cylindrical shell was replaced with a conical one. At the Kherson Combine Plant the hydraulic drives for lifting and turning the furnace roof, and also the baths, were replaced with electromechanical drives, which made it possible to prolong the maintenance period for the tipping and turning mechanisms by a factor of 1.5-2.

So, generalizing the experience gained by the machine building plants in the republic enables us to conclude that the economic effect of updating technological equipment and the growing influence of modernization on the technical-economic indicators of machine building enterprises and associations are quite high. Wherever the proper attention is given to the modernization of equipment and current and long-term plans for carrying out modernization are drawn up and implemented and the technical level of equipment is raised during the process of modernization, a high return from investment is assured, worker labor productivity is raised, and working conditions are improved. However, at many enterprises they underestimate the economic advantages of modernization, and this is reflected in the relatively small scales on which it is done and in the orientation on relatively minor improvements in individual design elements in machines, equipment, apparatuses, tools and technological gear.

In some cases expenditures on equipment modernization carried out at machine building plants in the republic have a pay-back time of 5 or 6 years. Such cases essentially indicate that at individual enterprises economic work on substantiating the modernization of equipment is not conducted at the proper level. And this, in turn, has adverse consequences since it disorients the workers and distorts the actual role of equipment modernization as a form of technical progress at enterprises, and leads to the discredit of technical improvements themselves and to unjustified expenditures of manpower and monetary resources.

Increasing the scale and improving the effectiveness of equipment modernization require careful economic substantiation and planning. During the process of



research in this it has been established that at many enterprises modernization is carried out without consideration of the overall plan for the introduction of new equipment, or it is simply not planned at all. As a result, more than 40-45 percent of all modernization is so-called maintenance modernization, during the course of which physical wear is partially eliminated and the technical-operating parameters of equipment are slightly improved, while the actual productivity of the machine tools is improved only very marginally, by 3 to 5 percent.

Up to now the selection of objects for modernizations in the machine building enterprises has been largely effected without any deep study of the technical level of existing equipment and its conformity with similar new Soviet-made or foreign equipment. As a result, during the process of equipment modernization two extremes are observed: on the one hand, when modernization objects are selected, very worn equipment is sometimes chosen, which considerably increases costs on effecting the modernization because in this case during the process of modernization a new machine or machine tool is virtually developed from scratch; while on the other hand, relatively new equipment is modernized--equipment that has operating characteristics very close to the indicators for the up-to-date models of equipment of similar designation. In many cases all this prevents improvement in the technical characteristics of equipment (productivity, accuracy, reliability and so forth) when modernization work is done.

Very often it is just one task that is resolved by modernization: labor productivity growth, or extending technical facilities, or simplifying the control of a machine tool or machine. Meanwhile, the greatest effect from modernization of equipment can be achieved through the comprehensive resolution of a number of production tasks, primarily improving equipment productivity and increasing mechanization and automation while at the same time extending the technical facilities of equipment.

Up to now no exact definition of modernization has been made in the state standards. Consequently, sometimes any changes introduced at the machine building enterprises in the design or external appearance of operational and series produced equipment are called modernization. There are also defects in the organization of planning work for modernization. As a rule, only the total amount of equipment that is to be updated is determined. Accordingly, in order to fulfill these control figures, any work on any equipment, arbitrarily classified as modernization, is included in the plan at the enterprises. And the economic calculations that confirm the expediency and effectiveness of modernization are not made. Finally, the manufacturing plants do not participate in the modernization of their own equipment that has become obsolete during the process of product operation, and they do not work out and pass on to the enterprises any standard plans for modernization or recommendations for assimilating the elements of new models. Accordingly, virtually all work on equipment modernization is carried out on a decentralized basis through the efforts of enterprise repair subdivisions, with all the negative consequences stemming from this.

It is advisable to draw up long-term (five-year) plans for the modernization of existing tools of labor, and to link these plans closely with the plan for

the introduction of new equipment. This will make it possible to reveal the actual requirements for equipment modernization in all sectors of machine building and thus insure implementation of plans for retooling in each sector and individual enterprise; to produce in good time the technical documentation for carrying out modernization; to determine the requirements for labor, financial and material resources needed to carry it out; and to resolve questions of centralizing work on modernization and capital repair. And in the five-year and annual plans provision should be made for interlinked targets to renew the production equipment inventory through replacement and modernization.

The studies show that a definite dependence exists between the length of the service life of machines and equipment and the scales of modernization. The longer the amortization period of the means of labor the greater the possibilities can be, all other things being equal, for carrying out modernization. And contrariwise, reducing the amortization period for the operation of available equipment leads to a contraction of the scales of modernization. As is known, the present stage in economic development is typified by an acceleration in the turnover for advance payments for the means of labor, seen in particular in the use of higher norms for amortization for renovation and leading to shorter periods during which machines and equipment function. In the long term, the important role of modernization as an element of technical policy that eliminates equipment obsolescence and physical wear and tear will be retained, for the following reasons.

First, from the economic viewpoint, the modernization of equipment is more effective if it is done within the optimal time frames of its service life. For most kinds of general machine building equipment the optimal time frames for service life are 10 to 15 years. It is precisely during this period of the operation of equipment that the bulk of modernization is carried out.

Second, a significant gap now exists between the time frames for the replacement of models of equipment produced (5 to 6 years) and the normative time for its functioning at industrial enterprises. In the long term this gap will undoubtedly be narrowed. Meanwhile, the qualitative level of new and replacement equipment can be extremely different. Only modernization can smooth over these differences to some extent.

Third, in about two-thirds of cases the modernization of equipment is combined with capital repair. Numerous studies have established that capital repair as an important form of expanded reproduction of fixed capital will retain its significance in the foreseeable future. Accordingly, the significance of modernization will also be retained in the long term, and its scales should undoubtedly grow as the inventory of equipment grows and its technological and design complexity increase. Thus, modernization should not be regarded as a temporary measure or transitory phenomenon associated with the fact that in the immediate future the machine tool industry will be unable to insure the replacement of all physically worn out and obsolete equipment with new, technically improved equipment.

Undoubtedly, even given all its technical and economic significance, modernization cannot play the same kind of role as the introduction of new equipment in the renewal of fixed production capital. But in all cases, obsolete equipment

can be renewed with the aid modernization and brought up to the level of new equipment of similar production-technical designation. At the same time, at some definite stage in the operation of various kinds of equipment it is necessary and economically expedient to modernize it.

The modernization of production equipment is essentially a technical problem. Of course, during the course of its preparation and implementation it becomes possible to make practical use of the latest technical principles and innovative proposals from production efficiency experts, and to employ more advanced structural materials. Modernization opens up a broad field of activity for mass creative search in advanced engineering and technical thinking. At the same time this problem, as pointed out above, also has an economic aspect. The role of economics is growing, particularly at the present stage in the development of equipment when basic changes have taken place in the possibilities of providing the industrial enterprises with new machines and equipment. Now, in contrast to the period of acute shortages of equipment, each enterprise has alternatives in its choice of technical decisions: to modernize obsolete and worn out equipment or replace it with new equipment that is more efficient and economic.

It is most expedient economically to modernize production equipment when capital repairs and overhauls are being carried out. This provides an opportunity for accelerating its rates and reducing down-time and costs through saving time on laborious fitting and assembly operations.

In order to expand the scales of modernization of metalworking equipment in machine building in the republic and to enhance its effectiveness, it is advisable to implement the following measures: increasing the proportion of all expenditures spent on modernization as part of the total spent on the introduction of new equipment, raising the total from 1.5-2 percent to 5 or 6 percent in the long term; extending the practice of effecting comprehensive modernization in which the technical level is substantially raised and the technical-operating characteristics of machines and equipment are improved; drawing up current and long-term plans at machine building enterprises for the modernization of equipment; increasing the scales of centralized production for spares and standard assemblies for equipment that is updated; raising the effectiveness of cost accounting in repair subdivisions at machine building plants.

In accordance with the decisions of the 26th CPSU Congress, in the European part of the country, in the long term through 1990 new industrial construction will take place on limited scales. This is because of the shrinking possibilities for recruiting additional manpower and the high degree of economic development of the territory, and also because in machine building in the country an enormous production potential has already been created whose utilization is in general inadequate. In other words, in the future the center of gravity in the sphere of investment policy should be shifted toward the reconstruction and retooling of machine building enterprises and associations in order to make maximum use of material, labor and financial resources.

In this connection the role and significance of modernization as an important form of production retooling is growing substantially. As noted in the decisions

of the 26th CPSU Congress, within the country's industry it is necessary "...to make more extensive use of progressive systems for equipment repair and modernization." At the Ukrainian Communist Party 26th Congress, V.V. Shcherbitskiy also drew special attention to the expediency of making a more decisive turn during the current five-year plan toward the use of intensive sources for economic growth. Modernization is essential for the practical realization of this task. Thus, qualitatively restructuring the republic's machine building complex, solving tasks of comprehensive intensification of production, accelerating scientific and technical progress and improving labor productivity are closely linked with raising the technical level of the equipment that is produced and operated, and this is largely insured by carrying out modernization work on this equipment.

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## INCREASE IN EFFICIENCY OF SCIENCE NECESSARY FOR PROGRESS

Moscow IZVESTIYA in Russian 3, 4 Jul 84

[Article by IZVESTIYA science commentator B. Konovalov: "Progress Begins With Science"]

[3 Jul 84 p 2]

[Text] 1. Revolution or Evolution?

Ask anyone: Where in our country are the main scientific forces concentrated? They will almost certainly reply to you: in the Academy of Sciences. And what is more, they will look with bewilderment: the man, they say, does not know simple things. But is this popular opinion so correct? Yes, the most skilled specialists are at the Academy of Sciences. But let us look at the quantitative aspect of the matter. At present there are more than 1.4 million scientists in our country. So then all the academies taken together: the union, republic, agricultural, medical and pedagogical, account for less than one-tenth of the scientists. There are approximately 500,000 workers of higher educational institutions, of whom scientific teaching personnel make up the bulk. Hence, the still recently modest "sectorial sector of science" now accounts for about 800,000 scientists. At the Academy of Sciences there are only 50,000 of them.

The voice of one scientist, provided he is not a pure theorist, "is the voice of no scientist." So that science would be a productive force, it is necessary to support it with an entire army of engineers, technologists, designers, laboratory workers and technicians, whose task is to realize scientific ideas. As a whole about 4.5 million people are now employed in the country in science and organizations of scientific service. And sectorial science accounts for the lion's share of them. Therefore, when we speak of the increase of the efficiency of science, it is necessary to realize clearly that today this should apply first of all to scientific research institutes, design bureaus and planning institutes of ministries and departments. The achievements of academic science and the science of higher educational institutions with rare exception advance to production also through these sectorial organizations. And precisely they now determine the level of domestic technology, the rate of scientific and technical progress and in the end of the entire national economy depends on them. Therefore, the monitoring of the development of sectorial science is acquiring paramount importance.

The USSR State Committee for Science and Technology is performing such work and intends to intensify it. Thus, during the check of the work on the streamlining of the network of scientific institutions in recent years the state of affairs in 50 ministries and departments was examined. As a result decisions on the elimination of about 150 institutions of science and scientific service and the transformation of 60, the activity of which was recognized as unsatisfactory, were adopted by the ministries and departments of the USSR and the union republics.

A new stage--the comprehensive analysis of the efficiency of the work of the scientific institutions of a number of ministries--began recently. It is planned in a year to review the work of five or six ministries and to notify all the others about the conclusions. The Ministry of Mineral Fertilizer Production was the first to undergo this test. It was chosen in the capacity of the "firstling" as a quite typical and comparatively small one on the scale of sectorial science. In this sector there are 12 scientific research organizations and 10 pilot plants. One of them was established during the period of the check, which did not leave the ministry indifferent and prompted it to a large number of steps.

As a whole the organizations of science and scientific service of the Ministry of Mineral Fertilizer Production are making a significant contribution to the progress of the sector. Modern highly productive plants and advanced technological processes have been developed in the industry of mineral fertilizers and chemical means of plant protection. The USSR now accounts for 21 percent of the world production of fertilizers. The volume of production of the products of the sector in 3 years of the current five-year plan has increased by more than 1.2-fold. The successes of the sector are closely connected with the successes of its science.

At the same time a number of shortcomings were noted in the activity of the scientific institutions of the Ministry of Mineral Fertilizer Production. Many of them apply only to this sector, but some are important for all.

The economic evaluation of the efficiency of science is of enormous importance. And, it would seem, those doing the checking and those being checked should speak the same language, use a uniform method and obtain unambiguous results. In reality it is not turning out that way.

In the report of the scientific and technical commission, which is checking the scientific institutions of the Ministry of Mineral Fertilizer Production, it is recorded that the economic impact from the implementation of scientific and technical measures in the sector in 1981 and 1982 came to 160.9 million rubles.

"This figure is too low," V. N. Men'shov, chief of the Administration for Science and Technology of the ministry, and V. B. Tardov, his deputy, told me. "We take into account not only the saving from the decrease of the product cost in the sector, but also the impact in the national economy as a whole. It is confirmed here by the corresponding statements. And in 1981 and 1982 it comes to 400 million rubles. While in 1983 it comes to 236.9 million rubles."

But in the speech of First Deputy Minister A. A. Kochetkov in the collegium of the State Committee for Science and Technology, the text of which I obtained in the same Administration for Science and Technology, it is stated: "During 1981-1983 the economic impact from the introduction of scientific and technical measures came in the sector to nearly 300 million rubles."

As you see, even within the ministry itself there is no unambiguous evaluation of the economic efficiency of the work being performed on new equipment.

A person, who comes across this picture, is quite capable of getting the impression that the calculation of the economic impact, to put it mildly, is a flexible matter--wherever he turned, it turned out. The data on the economic efficiency per ruble of expenditures also reinforce this opinion. In the report of the inspection commission the following figures are cited: in 1981 2.85 rubles per ruble of expenditures, while in 1982--2.69 rubles.

But according to the data of the Administration for Science and Technology of the Ministry of Mineral Fertilizer Production in the sector there is a stable and appreciable increase: in 1981--3.6 rubles per ruble of expenditures, in 1982--4.29 rubles, in 1983--5.24 rubles. As you see, the picture is completely different, although the calculations seem to be made according to a uniform method.

We will not now delve into the dispute of who is right--those doing the checking or those being checked. They can clarify this themselves. But we will direct attention to another thing. The economic impact in case of the calculation of this indicator is taken at different stages of development. At first the anticipated impact--this is in essence a forecast. At the middle phase, when the client officially confirms the data of the developers, there is the guaranteed impact. The country will obtain it, if the development is introduced on the planned scale. And, finally, there is reality--the actual economic impact. The last one, as we understand, is usually less than the first two. But at times these "impacts" are replaced owing to the lack of proper skill, but more often deliberately, and the institution looks better than it is in reality.

Now about the expenditures. In the recommended method they are calculated according to the principle "we write three, have two in our head." Not the total expenditures of the institution, but only those which went for the given specific development, are taken (the pay of the administrative and managerial staff is included here as overhead). The expenditures on the work on labor safety practices, environmental protection and, finally, the assurance of a scientific research for the future are not taken into account. As a result the indicator, which works well in case of the analysis of groups of the immediate specific developers of new equipment, is of little help in case of the overall evaluation of the activity of institutions. Therefore they use locally "homemade indicators," especially when tallying the results of the socialist competition.

"In my opinion, it is necessary to improve the methods of evaluating the economic efficiency of scientific institutions with allowance made for all the

expenditures on the conducting of research and the introduction of its results in production," says V. N. Novosel'tsev, chief of the Chemistry Department of the State Committee for Science and Technology.

In the recent past he was the general director of the Tekhnergokhimprom Scientific Production Association of the Ministry of Mineral Fertilizer Production and can evaluate the efficiency of research both from an internal standpoint--of the ministry, and from an "external" standpoint--a "statewide" standpoint. So then, in his estimation, the economic efficiency comes to approximately 1 ruble per ruble of all expenditures on scientific research and experimental design organizations.

If one simply divides 300 million rubles (which were obtained, according to the data of the First Deputy Minister of Mineral Fertilizer Production, in 3 years of the five-year plan by means of the introduction of scientific and technical measures) by the amount of financing of ministerial science (in a year about 100 million rubles are allocated for this), the same ruble per ruble of real expenditures on the maintenance of science is obtained. But by no means the more than 5 rubles, as they optimistically concluded for 1983 in the Administration for Science and Technology of the Ministry of Mineral Fertilizer Production.

True, it must be noted: in spite of the optimistic indicators, here they understand perfectly well that all the same the yield of sectorial science should be greater. And they are striving to increase it practicably. A plan of measures on the changeover of scientific research and planning and design organizations to financing for jobs, which have been completely finished and have been accepted by the client, has been drafted and is being implemented in the ministry. Already six institutes have changed over to payment for the end result. The remainder will be changed over to this system next year.

Previously the developments of institutes could collect dust for years on shelves. No one actually bore responsibility for this. Now the all-union industrial associations of the Ministry of Mineral Fertilizer Production are acting as the clients of the jobs. They grant credit to the institutes through the bank. At the same time this credit falls on the balance of the enterprise, for which the work is being done. If it merely orders developments, but does not use them, these amounts will hang as "dead weight." Any check will easily reveal the inactivity of the enterprise. In case of such a system triple responsibility results: of the performing institute, the client ministry and the enterprise itself. The Administration for Science and Technology as before, and not the industrial associations of the ministry, finances the research work of the institutes. It can give orders for some studies or others not only to its own institutions, but also to academic laboratories and laboratories of higher educational institutions. The system is theoretically well-balanced and appealing.

But here is what kind of question arises: Will such a system not become a barrier in the way of work, which is protracted, labor-consuming and risky,

but does not promise in case of success the radical improvement of production? There is concern for "a bird in the hand," but how is it with "two in the



bush"? I conversed with many people on this theme in the State Committee for Science and Technology, the ministry and the institutes. And they replied honestly to me: such a danger is real, and it is necessary to think about how to eliminate it.

Unfortunately, current practice is inciting science first of all to save jobs and the minor improvement of production. Along with this the assignments of the state comprehensive programs are being upset. It is alarming that the Ministry of Mineral Fertilizer Production is not fulfilling the assignments on the saving of raw materials and energy resources. The tendency for the proportion of minor themes to increase is being clearly traced at the institutes of the sector. Thus, at the State Institute of the Nitrogen Industry and the Products of Organic Synthesis in value terms the amount of completed work in 1982 as compared with the indicators of the 10th Five-Year Plan increased by 4.2 percent, while in quantity it increased by 28.5 percent, at the Kazniigiprofosfor expansion unknown in value it increased by 6.15 percent and in quantity by 72.4 percent.

The state of industry depends on the scientific reserve. If today proper attention is not devoted to the stimulation of operations which promise the radical improvement of production, tomorrow it is possible to find oneself stranded. And although the sectorial ministries can spend on this up to 20 percent of the assets allocated to them, actually much less goes for the reserve, and this is arousing the apprehension that the tendency to do a bit more work, which is minor and not fundamental for the national economy, will be preserved.

Let us put it this way: sectorial science for the present is working as a kind of "society of moderate progress." The state expects of science not minor improvements of the existing processing methods, but radical improvements; the appreciable decrease of the product cost and a major contribution to the increase of labor productivity. As life has shown, in responding to the appeal of the party, the labor collectives of enterprises can decrease the production cost by 0.5 percent and increase labor productivity by 1 percent on their own, by using the internal reserves. From science we expect an impact of tens of percent, tens of times. The age of the scientific and technical revolution is also for this. Otherwise this will be scientific and technical evolution, and not a revolution.

[4 Jul 84 p 2]

[Text] 2. In the Association There Is Strength

At present 5,500 scientists work at the institutions of the Ministry of Mineral Fertilizer Production. Among them are 55 doctors of sciences and more than 1,400 candidates of sciences. Is this a lot or a little? At the USSR Academy of Sciences there are 50,000 scientists. Imagine that a tenth of them are engaged in only one direction--fertilizers and means of the chemical protection and stimulation of plants. Probably, this would seem to be hypertrophy.

In short, there are quite enough scientists in the Ministry of Mineral Fertilizer Production for the accomplishment of the tasks facing the sector. But with the sphere of scientific service the situation is different.

In all about 13,000 people are employed in the sector in science and scientific service. Hence, there are approximately 1.4 technologists, engineers, designers and attendants of laboratories and pilot experimental plants per scientist. There are only 1.4 people for the entire chain, which should carry the baton from the idea of the scientist to the finished device or some advanced process which it is possible to recommend to industry. This is much less than the norms of world practice and less than on the average for the country.

In fact in the Ministry of Mineral Fertilizer Production the scientists themselves perform low-paid work. The underutilization of their scientific potential is incorporated in the manning table.

The point of the existence of the sectorial scientist lies in turning his development over to industry. But for this it is necessary to check the idea in advance at the pilot plant and to demonstrate that it is advanced. Pilot plants exist for this in every sector. In the Ministry of Mineral Fertilizer Production 4,100 people work at these plants. It turns out that there is only 0.75 worker of pilot production per scientific associate. This is appreciably less than in related sectors. While the recent decree of the CPSU Central Committee and the USSR Council of Ministers of 18 August 1983, "On Measures on the Acceleration of Scientific and Technical Progress in the National Economy," obliges ministries and departments to direct the most serious attention to the development of pilot production.

"In reality more people are employed here in pilot production," they told me in the Administration for Science and Technology of the Ministry of Mineral Fertilizer Production. "About 2,000 more people work at the plants of the industrial enterprises which serve science."

So be it. But if you are to speak honestly, it is necessary not to add, but rather to subtract, because many plants, which are registered in the sector as pilot plants, in fact operate as industrial enterprises. The commission of the State Committee for Science and Technology noted that the performance of development work in the total production volume of the pilot plant of the Tekhnergokhimprom Scientific Production Association came in 1982 to about 10 percent, the Minudrobreniya Scientific Production Association--about 27 percent, the All-Union Scientific Research Institute of Chemical Means of Plant Protection--only 4 percent. Koz'ma Prutkov preached: "If on the cage of an elephant you read the inscription 'buffalo,' do not believe your eyes." Is it really possible to regard as a pilot plant the plant which yields 96 percent commodity production? They say that the batches are small, the compounds are specific, the plant has assimilated production, but there is no one to turn it over to. No one is calling to close this works--in such a case it is simply not necessary to group the plant with pilot plants.

A number of scientific research organizations, including the Khimashremont Special Planning and Design Bureau, the Leningrad State Institute for the Planning of Plants of the Basic Chemical Industry and the All-Union Scientific Research and Planning Institute of Metallurgy, do not have at all their own experimental bases. At some institutes--the Kazniigiprosfor and the VNIPiser expansion unknown --there are so few instruments and scientific equipment per staff member, that you would not call such organizations anything but "paper." And not by chance is the yield per ruble of expenditures the lowest here.

Deputy Chairman of the USSR Council of Ministers and Chairman of the State Committee for Science and Technology Academician G. I. Marchuk in the collegium of the committee expressed his opinion clearly and sharply: "We will close institutes, if they do not create a pilot production base for them." The 150 organizations, which have already been closed during the streamlining of the network of scientific institutions, testify that such sharp words are uttered not to shake the air, and the ministries must draw the conclusions.

It was recommended to the Ministry of Mineral Fertilizer Production to set up a large number of new scientific production associations in addition to the two which already exist. The closer association of sectorial science with production is being planned as the main means of development.

It cannot be said that it is simple and easy. Many unsolved problems and difficulties are arising. For the present integration is occurring mainly mechanically. Frequently in the existing scientific production associations the institutes, design bureaus, planning organizations and pilot plants retain legal independence. They have their own planning divisions, accounting offices and bonus systems. Scientific subdivisions are financed through the State Bank, planning subdivisions are financed through the All-Union Bank for Financing Capital Investments. On the administrative level the scientific production association turns out to be "the servant of three masters." As a whole the association and its plants are subordinate to the corresponding all-union industrial associations of the Ministry of Mineral Fertilizer Production, the Administration for Science and Technology runs the scientific part, the Capital Construction Administration runs the planning part. As a result situations, which are known from the fable "The Swan, the Pike and the Crayfish," frequently arise.

The inspection commission commended the successful work of the Minudrobreniya Scientific Production Association. And I asked General Director A. A. Novikov: Does he consider the means of the mass establishment of scientific production associations to be promising?

"Certainly," Anatoliy Artem'yevich replied. "There are, of course, more than enough difficulties, but all the same the association is strength, many questions are settled more simply, it is easier to set up interrelations. We now have our own science, a planning institute, experimental plants and test fields. The scientific production association has existed for a short time--since 1980, but we have already been able to do much. The amount of research work in this time has increased in monetary terms by 1 million rubles, while

the number of scientists has decreased by 200. We have accomplished a large number of difficult tasks. Previously, for example, we bought superphosphoric acid in the United States. In recent years, to put in mildly, this has caused a large number of inconveniences. We set up a multiple-skill multistage group of researchers, designers and planners, gathered them, as they say, in one fist and developed a domestic processing method. The work was begun in the middle of 1983, while in November of this year a shop with a capacity of 150,000 tons of superphosphoric acid a year (the largest in Europe) will be put into operation in Krasnodar. If they had worked according to the usual plan, 7-8 years would have been spent on this."

"Anatoliy Artem'yevich, still, what most of all is now preventing you from working?"

"The manning table. Tell me, please, why the size of a laboratory must be without fail not less than 40 people. For in that way we inflate the staff in a forced manner. For example, we have a corrosion laboratory--24 associates. And we do not need more. But every year I have to go to the minister to ask that as an exception they would allow us to have in this and several other laboratories less than 40 people. But the auditors all the same point out: this is a violation. And it is fine if they simply point it out, but then at times they fine us. What nonsense. We dream that they would allocate to the scientific production association only a wage fund, while we ourselves would determine how many and what kind of specialists we need for the accomplishment of the posed tasks. The state would only gain from this."

"And this here also interferes," Novikov indicates the telegrams on his desk. "All the time it is necessary to send people to the plants with something to investigate, help, finish up, change, repair. We are busy not with our own work. They do not call us to wherever there are good central plant laboratories. But many enterprises regard us as a fire brigade which is obliged to jump at the first alarm. But these after all are not new, but operating, developed works."

It turns out that intrasectorial "duty" for scientific institutions is a very heavy burden.

"This is a serious problem," says V. M. Kudinov, deputy chairman of the State Committee for Science and Technology, who heads in the committee the commission for the streamlining of the network of scientific institutions of the country and the checking of their efficiency. "The diversions of the workers of scientific institutions from their immediate duties make up approximately a third of the total amount of their activity. The ministries claim that the accompaniment of operating works by science is necessary and no one will cope better than scientists with this essentially purely engineering matter. Fine. But then it is necessary to set up special cost accounting subdivisions which would perform this work. But now at every step a person seems to be registered at a scientific research institute, while he is busy a large part of the time not with the development of new equipment, but is helping to adjust operating, series production."



Let us consider the scale of the phenomenon. The scientific associate spends a third of the time not on research, but on the servicing of operating production and the fulfillment of the functions of the workers of the staff of the ministry. Hence, many fewer people are actually engaged in research and the development of new equipment and processing methods. While hundreds of thousands of workers are in essence an "addition" to researchers, if we call a spade a spade. This is millions of rubles of wages, which are paid monthly to people not for the work which they should be performing. But such rather harmful things as the increase of the labor productivity of plant workers at the expense of others and the worsening of the indicators of the activity of scientific institutions are, after all, behind this. Of course, you would not call such a situation normal.

The critical view of the sector was useful for both the ministry itself and the State Committee for Science and Technology. Now much is being done for the elimination of the identified shortcomings. Problems, which for the present are hindering the development of sectorial science, are being worked on. It is important that the time of its uncontrolled existence is ending. I would like to write, of course, "has ended." But let us remain realists, let us not pass off what is desirable for what is real.

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CSO: 1814/187

## BETTER COORDINATION BETWEEN ACADEMY AND SECTOR INSTITUTES URGED

Moscow SOVETSKAYA ROSSIYA in Russian 31 May 84 p 2

[Article by V. Boldyrev, correspondent member, USSR Academy of Sciences, director, Institute for the Physical Chemistry of the Solid State and the Processing of Minerals: "Until the Invention Becomes Obsolete"]

[Text] Everyone knows that completing the main task facing the country in the immediate future -- the conversion of the national economy to an intensive path -- depends to a great extent upon the rate of acceleration for scientific and technical progress. Decrees concerning this problem stressed that in the immediate future industry should have output with indicators meeting the best contemporary standards, introduce progressive manufacturing processes and on this basis substantially improve labor productivity in the national economy. I think that it would not be mistaken to say that the mechanism for applying scientific achievement to production is definitive to this task.

The natural and rational route for an innovation born within the walls of an academy unit implies its obligatory "refinement" in a sector institute. Unfortunately, this is more the exception than the rule. This is witnessed by the sad experience in introducing scientific developments of our, and from what I know, other institutes of the USSR AN [Academy of Sciences].

How this occurs can be shown by an example of our institute's work on a new method for metal plating dielectrics. This is an exceptionally important problem. It is very often necessary to put a metal coating on plastic, ceramic or porcelain. It is far from easy to obtain a homogenous metal layer.

Take, for example, printed circuits, which have replaced the artfully interwoven conductors in old devices and made their miniaturization possible. Small conductors mounted on a dielectric surface are used to transmit signals in them. To send a current from one side of the circuit card to the other, a hole is drilled and coated with a layer of metal. This is one of the most difficult chemical processes. Initially the surface is worked with several reagents, including scarce ones such as palladium. After that, a layer of conducting metal, for example, copper, is deposited on it. This is done by several methods. In all, it is necessary to use at least 15 processes.

Can't this technology be simplified? Instead of expensive palladium we decided to use copper itself as the catalyst for depositing copper and to use solid

phase chemical reactions instead of the series of difficult reactions in solutions. Such reactions are in our academy unit's field. A group of scientists at the institute succeeded in developing a new technological process for metal coating dielectrics. It eliminates the narrowest bottleneck in the old method -- the use of palladium and the corresponding preparatory operations as well as the quite unpleasant and capricious (every technologist knows this) chemical copper plating stage.

The new method was well received by production workers. About 100 enterprises throughout the country sent requests about the process and about 30 of them conducted experimental and industrial testing, the results of which showed the advisability of introducing the promising technology. Another 30 enterprises are now conducting such tests. Some of them, for example, the Krasnaya Zarya Scientific Production Association in Leningrad, the experimental plant at the USSR AN's Siberian Department (Novosibirsk) and other enterprises have successfully introduced the innovation.

Specialists' response is ground for hope. For example, data from the Krasnaya Zarya Association show that the line for chemical metal coating has been reduced by 3 fold and labor productivity prior to galvanic coating has increased 4 fold. There are considerable improvements in printed circuit quali It appeared that the technology we developed would be taken up by sector institutes and refined to suit the specifics of sectors (and there are quite a few). It is mandatory to do this refinement for each sector and enterprise. If not, it is possible to have failures. This is understandable, after all every new method is distinguished by quite different basic approaches to solutions.

However, this is not the only problem. Workers at industrial enterprises are obligated to carry out all stages in accordance with GOSTs [State standards]. The GOST for printed circuits is already old! Who should "adapt" the technology, work up the documentation for a specific plant and approve a new GOST? This is not a task for an Academy institute. This is a matter for an organization which is obligated to follow everything new in science which might be useful to the sector.

However, they are not doing it. Time marches on. Foreign countries are interested in our scientists' invention. It has already been patented in the FRG and France. Do we have to wait until the method is introduced abroad and then use our foreign exchange to buy completed technology?

What conclusions come from all this? It appears that under the existing system of relations between production and academy and sector institutes it is hardly worthwhile to call upon "intersectorial altruism" and to place hopes upon future mutual understanding between them.

There are two routes which can be realistically discussed. The first is already widely used. This is the concentration of intersector research in the Academy of Sciences and its subsequent direct transfer to production. However, the Academy can hardly assume all responsibility for the introduction of such

work. For the majority of Academy institutes, not having a good experimental base, direct ties are possible only where they do not require the design and manufacture of complicated industrial facilities.

In addition, Academy institutes lack means of influencing sectors, apart from recommendations, which a sector can either follow or set aside, without bearing any responsibility.

We do have the USSR State Committee for Science and Technology. It appears that this is where the management of intersector developments should be concentrated. Introduction itself should be entrusted to specially created temporary collectives focused on specific tasks within the set time frame. The need to organize such units was noted in the CPSU Central Committee and USSR Council of Ministers Decree: "On Measures to Accelerate Scientific and Technical Progress in the National Economy", and in articles in SOVETSKAYA ROSSIYA on introduction problems. In our view, these collectives should not be transformed into organizations with an advisory voice, but should be given the rights and resources necessary for performing their functions. They should decide how to make extradepartmental expert reviews of the usefulness of proposals. They should also be responsible for targeted program deadlines. Upon completion of their tasks, such collectives could be reoriented towards other goals or dissolved.

Obviously, this cannot be done in a few days. The demolition of existing relations, views and systems, and the creation and breaking in of new ones is an extremely difficult task. However, this is no reason for slowness in its solution. In my opinion there are grounds for complaint about this. It is time to take the first decisive steps to accelerate the penetration of effective ideas and developments into practical work. It is no accident that in his meeting with workers at the Serp i Molot Metallurgical Plant in Moscow, comrade Konstantin Ustinovich Chernenko stressed: "The technical reequipment of sectors and the introduction of the newest achievements of science and technology have acquired special significance at the present stage. This is an urgent requirement of the time, one could say, the command of the epoch."

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## MACHINE TOOL INSTITUTE OFFICIAL CALLS FOR BETTER COMPUTER TRAINING

Moscow IZVESTIYA in Russian 25 Apr 84 p 3

[Interview with Yu. Solomentsev, rector, Moscow Machine Tool and Instrument Institute, Lenin Prize winner, by A. Bachmanov and M. Kazakov; date and place not specified]

[Text] [Question] Yuriy Mikhaylovich, society's attention is more frequently turned to the problem which A. Yershov, the Siberian mathematician and correspondent member of the USSR Academy of Sciences recently accurately called the "problem of the second literacy". How would you, the rector of a typical technical VUZ, evaluate the urgency of solving this problem in training young specialists today?

[Answer] In 25 years of computer hardware development, the capabilities of computers have increased 1,000 fold. I don't think there is another sector where one can find such an example. In one year the total world wide machine memory doubles. The process for manufacturing various machine components has become much cheaper than the creation of original new programs. More and more workers are being attracted to the production and use of computers.

Life undoubtedly demands the development and production of ultramodern, powerful computers. This is one side of the problem. The other side is the practical use of computers. Many computers with memories of various capacities have already been built. However, they are still not used with equal efficiency. You can draw your own conclusions from machines sitting idle, no concern given to maximizing returns on time and effort and if they do not discernably improve labor productivity

Nevertheless, they are truly powerful tools in the hands of creative, well trained people.

Our automated design specialists do amazing things, creating programs with capabilities which seem to exceed the limits the possible. The results are rapidly coming.

It is a very serious problem. Practically every specialist simply must learn to use a computer.

[Question] However, it is a practically insurmountable barrier to many people, even after fairly theoretical training. What, in your opinion, is the nature of this, alas, quite massive phenomenon?

[Answer] In my opinion, one should not under or overestimate the difficulties which arise, although they do, of course, exist.

In general, it isn't easy to learn something new, especially for old or middle aged people. There is a decline in the ability to learn. Age old habits must be overcome. One doesn't even have to look at a practicing engineer, but just one of our VUZ instructors, a direct participant in the training process. There could hardly be a more flexible specialist. He is in a situation requiring at most the use of an adding machine. Of course, he now has to exert tremendously much more effort to restructure himself. There is no other way, it must be done. The instructor understands this. A mass of specialists still must undergo a restructuring of their knowledge in this direction.

Furthermore, the machine requires precision of thought. The language we use to talk to it is, essentially "business prose" and is only a little more formalized than the language we use every day in professional discourse. The authoritative and essential need to have rapid and precise mutual understanding has made business prose a concise and powerful tool of expression. Fear of computers is most often the inability or incapability to think in a strictly disciplined manner and to be precise rather than approximate in using one's knowledge.

Some specialists have a unique "allergy to computers". Who would want to publicly admit to flaws in his professional education. The machine mercilessly reveals them.

There is one general conclusion -- learn to work with the machine. The task is to organize this training for specialists. As far as students are concerned, contact with computers is now an essential element of professional training.

[Question] Do the VUZ's have the necessary hardware?

[Answer] Unfortunately, the shortage of peripheral output devices is still limiting students' access to computers. To train them "by correspondence" is as absurd as to train somebody to ride a bicycle without giving them one. In a week or two of real practice a person can learn what would take years of explanation.

Our industry can produce the hardware we need. Bulgaria is already producing low cost output devices comparable to the better foreign models. They can do graphics and print in any language.

The widespread use of microelectronics and reductions in electronic component cost have made it possible to take machines out of computer centers. The "plant" requiring a large area and many services has been substantially reduced in size. The compact computer has become the basis of systems now being produced at instrument building plants which are already helping to automate research, design and control of manufacturing processes.

[Question] Specialists in the dialogue with computers love to say that if people don't come to computers, then computers will come to people. Is this perhaps worth waiting for?

There is no time for a long wait. We must do what we are obligated to. Life itself is speeding us up. At the institute we are solving problems with the help of computers and systems for automated design (SAPR). We have included all disciplines in the programs. Students now use computers during their studies.

Engineers today cannot really be fully creative with the new technology if they have not mastered the methods of automated design. Of course, not all specialists we train will become designers. Some of them will be operators. We have thought out and are developing a thorough program of computer training for those who go to the shop rather than to the drawing board. This system is different, but just as serious as the one for future design system developers.

[Question] Does the speed with which technical innovations are being introduced obviously require more flexibility in the training of specialists?

[Answer] In recent years we have undoubtedly been able to give students in the lower courses fundamental training which can be the basis for the now unavoidable changes in work profiles. We have improved the mathematics skills of VUZ graduates. They are now being developed in all courses. VUZ departments are actively participating in this process. The teaching of mathematics, physics and management courses is acquiring definite professional direction.

There should certainly be some "degree of freedom" and right to choose within the framework of required courses. In upper level courses many try to make corrections in their training. Any rector would be very proud to have more than double the selection of constantly changing specializations in the upper courses, giving students broader possibilities of "finding themselves". Unfortunately, however, the rights of a rector at a typical VUZ are rather restricted.

Future specialists should not always receive instruction in a passive manner. Students in senior courses should have a plan-based right to select special courses and participate in the formation of their professional skills. A psychological barrier grows up in the soil of inertia and the unconscious desire to decline "excess" work. The more conscientious students are in their approach to their future profession then the better will be the training. The future specialist should understand that it will be impossible to get along without a computer. High standards in computer use are an assurance of improvements in decision making and reductions in the personnel needs of various sectors. The computer today is the most important means for the intellectualization of specialists' labor.

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## SPACE SCIENCE MANAGER URGES BETTER RESEARCH COORDINATION

Baku BAKINSKIY RABOCHIY in Russian 1 Jun 84 p 3

[Article by A. Shchegolev, group manager, Department for the Coordination of Work on the Introduction of Scientific Developments, NPO [Scientific Production] for Cosmic Research at the AzSSR Academy of Sciences: "Elements of Integration"]

[Text] The technical modernization of sectors and the introduction of the latest achievements of science and progressive experience are of special importance in the contemporary era. However, we sometimes have too general an understanding of the integration of science and production. It appears the time has come to more precisely pose the problem of regulating cooperation between scientists, researchers, designers and production workers and between the disciplines involved.

The scientific production association is one of the most effective organizational forms. Its most important advantage is the reduction of the length of the research - introduction cycle. This is attained through the elimination of administrative and management barriers between scientific research and production units and the elimination of gaps between work stages. This makes it no longer essential to have a multistage procedure for various types of coordination between research and production collectives, and thus gets rid of such gaps, removing sector barriers between science and production. As a rule, the creation of an association also forms a production base for experimental work without requiring any additional capital investments.

However, these positive steps in the integration of sector scientific and production organizations are used mainly to solve applied problems. After all, associations have been set up and will continue to be set up in industry and agriculture. These are the sector centers bearing responsibility for their scientific and technical levels. The development of applied research is based primarily on the achievements of fundamental science. This is the sphere of institutions in the AzSSR AN [Academy of Sciences]. This means that the creation of sector associations with the existing applied structure still does not completely eliminate interdepartmental barriers to the movement of scientific achievements along the chain: "academic institute -- sector". The process of transferring scientific results obtained in academic institutions continues to be a bottleneck to scientific and technical progress.



The republic Academy of Sciences must further improve its role and responsibility for solutions to key economic problems, with a view to specialization in the all-union division of labor and to promising directions in economic development.

If one thinks it over, there are several directions for this. For example, academic scientific production associations can be the route. It is interesting, but difficult, frequently requiring sizable capital investments and substantial restructuring. However, it does not eliminate interdepartmental barriers to the spread of innovations.

It is possible and, of course, necessary to use positive experience in developing ties between academic units and production. An example of this is the organizational chain: institutes -- enterprises -- sector, comprehensive brigades of scientists and production workers, and the complex of academic institutes -- enterprise -- sector. In each case these ties should be primarily based on economic contracts or creative cooperation contracts. Such forms of cooperation accelerate local scientific and technical decision making. However, the obligations of academic institutes are limited by the contracts and often terminate when the time runs out.

There must be an improvement in the long term responsibility of "big science" for research on the most progressive types of technology and on finding fundamentally new directions in the development of various sectors of industry and agriculture. This can be attained through the direct attachment of academic scientific research institutes in the appropriate fields to leading sector scientific research associations, both newly formed and existing. Moreover, an institute could be attached to a number of associations in one or several sectors, depending upon the institute's field.

This attachment could be specified in directive documents at the republic or union level and its principle features described in instructional materials.

The academic institute attached to an association should have the functions of a base institute. It would be responsible for basic research defining new directions in this sector's development. Work along these lines could be financed through a single sector fund for the development of science and technology, which could be a supplement to the main system of state financing for academy science.

What would this provide? It appears that such a system might eliminate interdepartmental barriers to the utilization of results of basic and exploratory research. In addition, it considerably strengthens the responsibility of Academy of Sciences scientists for the intensive development of the republic's productive forces. This would not be just for one time, within a contractual framework, but permanent and long term. The evaluations of academic institutes' activities will include the scientific and technical standards reached by various scientific production associations and consequently by the sector, for the given period.

I want to note something else. Considering the degree to which the method has been tested, scientists frequently first focus their main attention on direct

economic ties. This is a necessary and useful form. However, there can be a "quantity syndrome" here: a contract with many small items. Thus, there are small research themes and unjustified outlays of labor and resources. Or this occurs, and it sometimes does: the work is complex and voluminous but is not an urgent subject, having direct significance for the development of the republic's economy.

The "academic institute -- scientific production association" scheme will be of great help in avoiding this situation. Moreover, there will be great precision in the division of obligations" between academic and sector science. This will eliminate parallelism, where an academic institute unjustifiably replacing a sector institute, does purely applied research which is a reliable link between basic research directed towards specific sectors and results and the applied developments resting on these results. Finally, planning problems will be made more specific. The Academy of Sciences' participation in state plans for the economic and social development of the republic and the country will be specifically reflected in sector long term and current plans for the development of science and technology, and directly in sector orders, playing the role of intraministry economic contracts covering all stages of work. Thus, in light of party demands, academy science can more completely fulfill its role in accelerating scientific and technical progress in the economy. It appears that the most effective form for strengthening contract discipline in academy units is to attach institutes to production associations.

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